Fig. 1

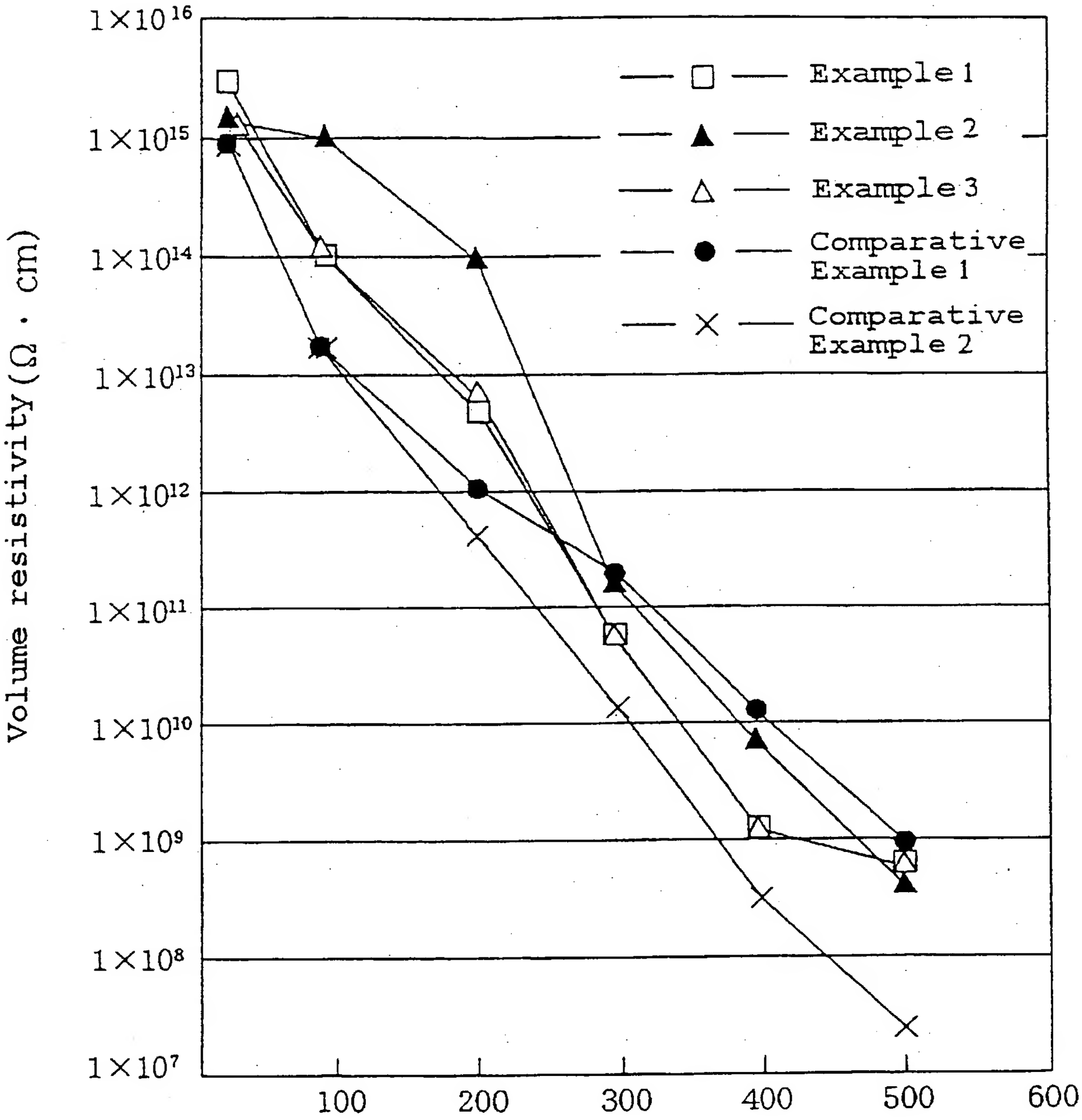

Volume resistivity (Ω · cm)
1×10¹⁶
1×10¹⁵
1×10¹⁴
1×10¹³
1×10¹²
1×10¹¹
1×10¹⁰
1×10⁹
1×10⁸
1×10⁷
100
200
300
400
500
600
Temperature (℃)
Example 1
Example 2
Example 3
Comparative Example 1
Comparative Example 2

Fig. 2

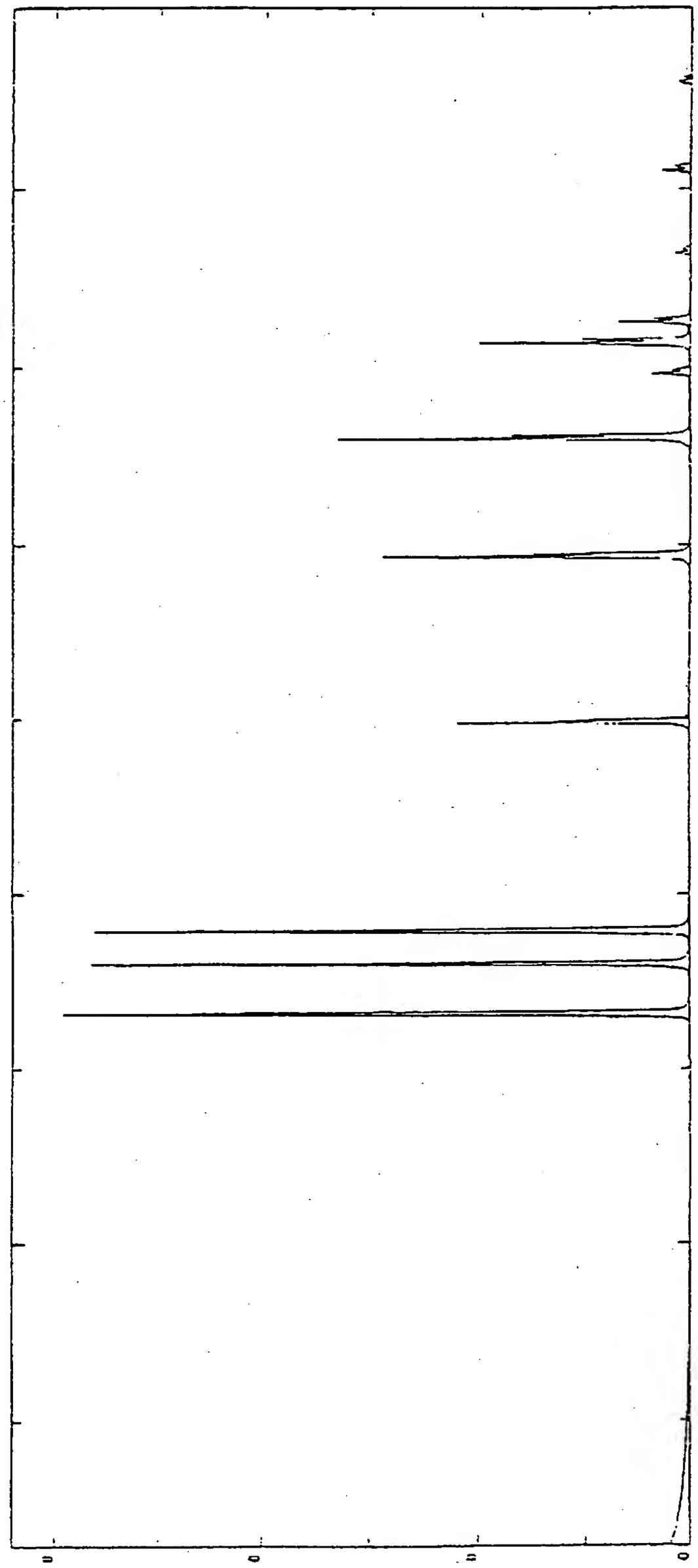

Intensity [cps]
160000
100000
50000
0
0.000
10.000
20.000
30.000
40.000
50.000
60.000
70.000
80.000
2 θ [°]
X-rays : Cu K-ALPHA/ 50 kV/ 300 mA
Goniometer : RINT 2000 wide angle goniometer
Attachment : Standard sample holder
Filter : Not used
Incident monochrome : Full automatic monochrometer
Counter monochrometer : Full automatic monochrometer
Divergent slit : "1deg."
scattering slit : "1deg."
Light-receiving slit : "0.3mm"
Counter : Scintillation counter
Scanning mode : Continuous
Scanning speed : 2.000 °/min.
Scanning step : 0.020 °
Scanning axis : 2θ/θ
Scanning range : 3.000 ~ 90.000 °
θ offset : 0.000 °
Sample name : Outside
File : T990603.0339
Comments : Wide angle measurement
Date of measurement : 03-Jun-99 15:59
Measurer : R I N T

Fig. 3

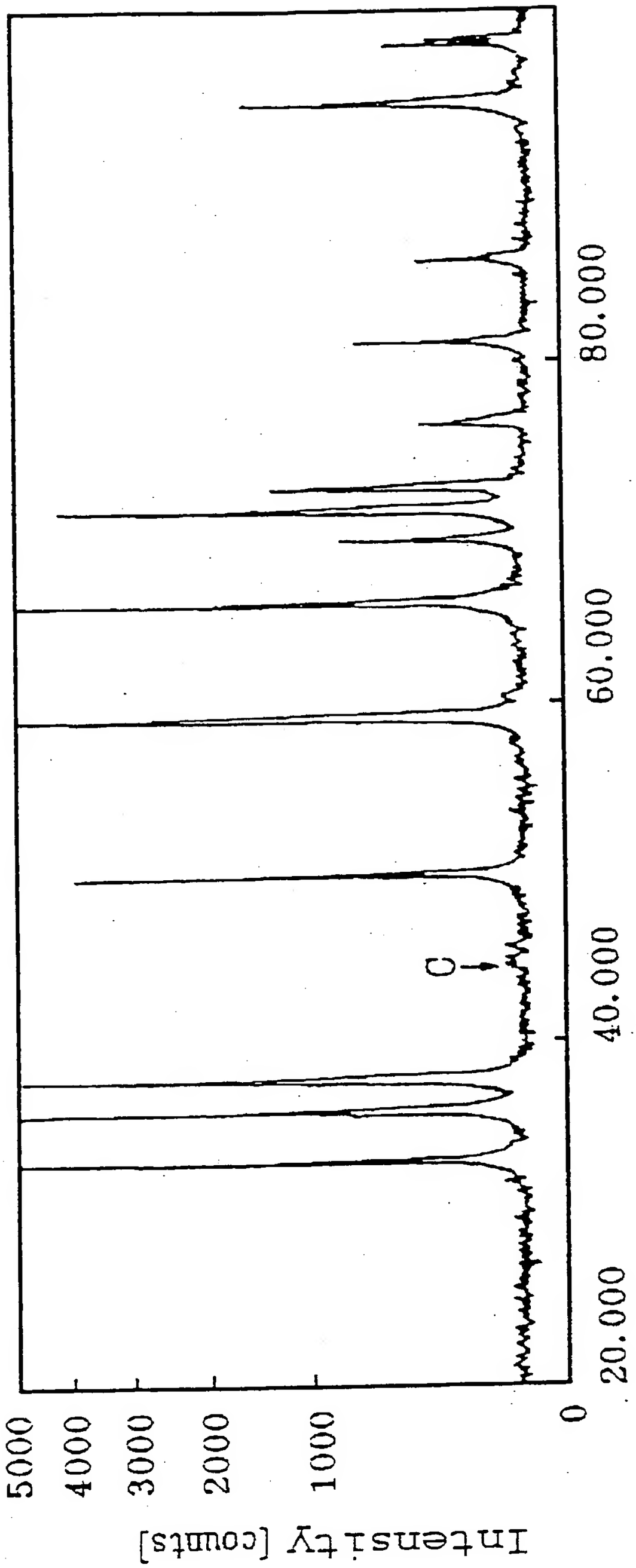
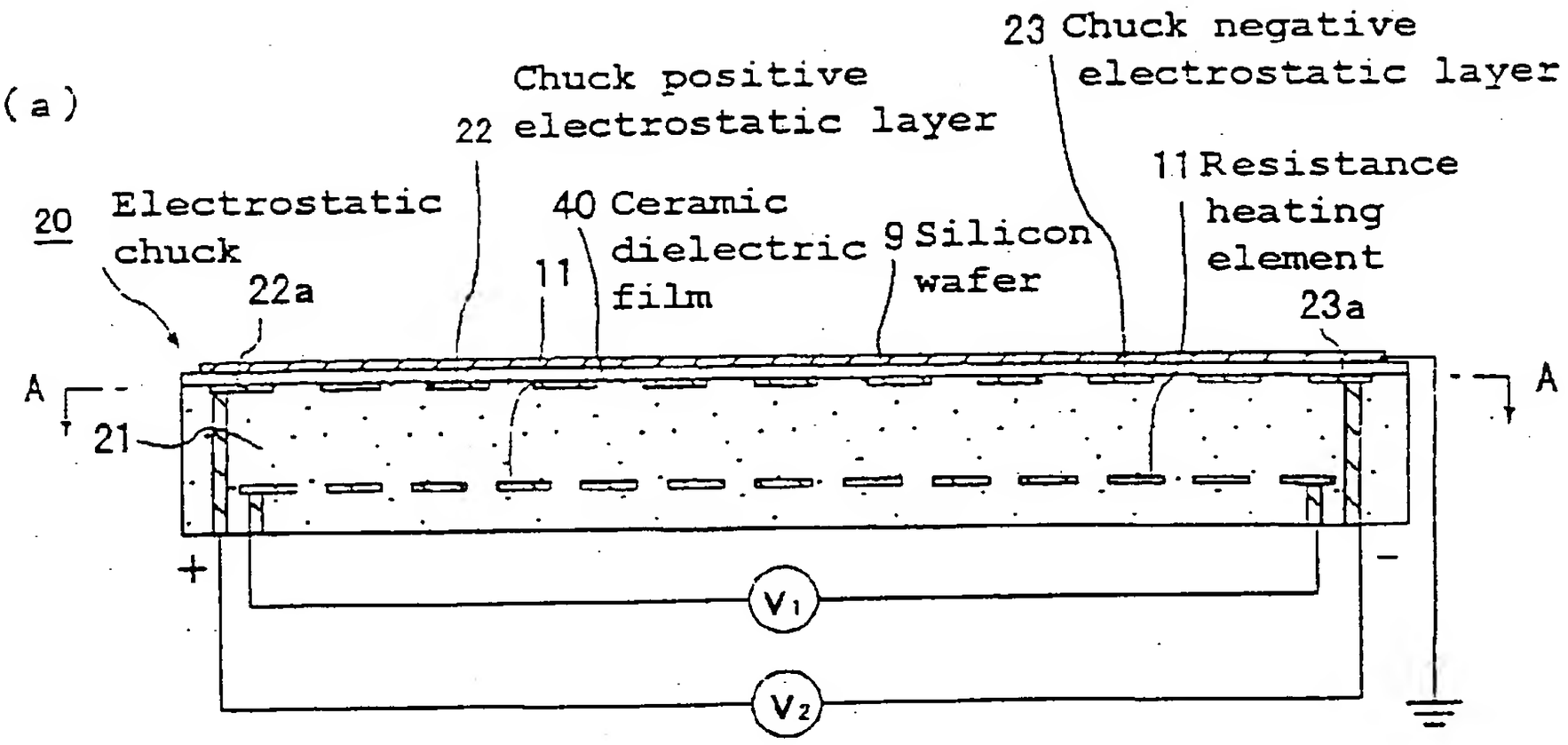

Intensity [counts]
5000
4000
3000
2000
1000
0
20.000
40.000
60.000
80.000
2θ [°]
C

Fig. 4

(a)


23 Chuck negative electrostatic layer
Chuck positive electrostatic layer
22
11 Resistance heating element
20 Electrostatic chuck
40 Ceramic dielectric film
9 Silicon wafer
22a
23a
11
A
A
21
+
−
V1
V2

(b)

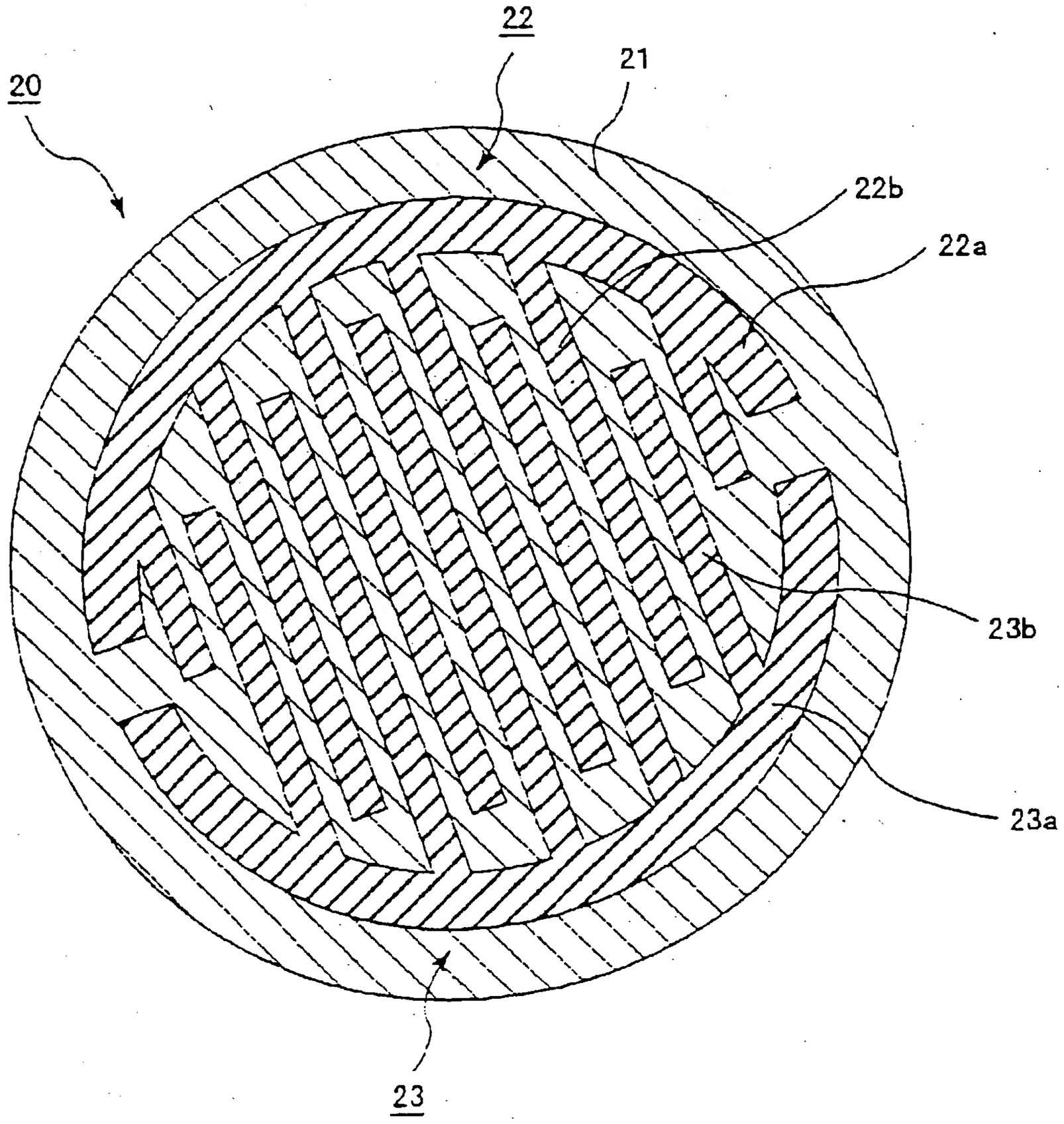

22
21
20
22b
22a
23b
23a
23

Fig. 5

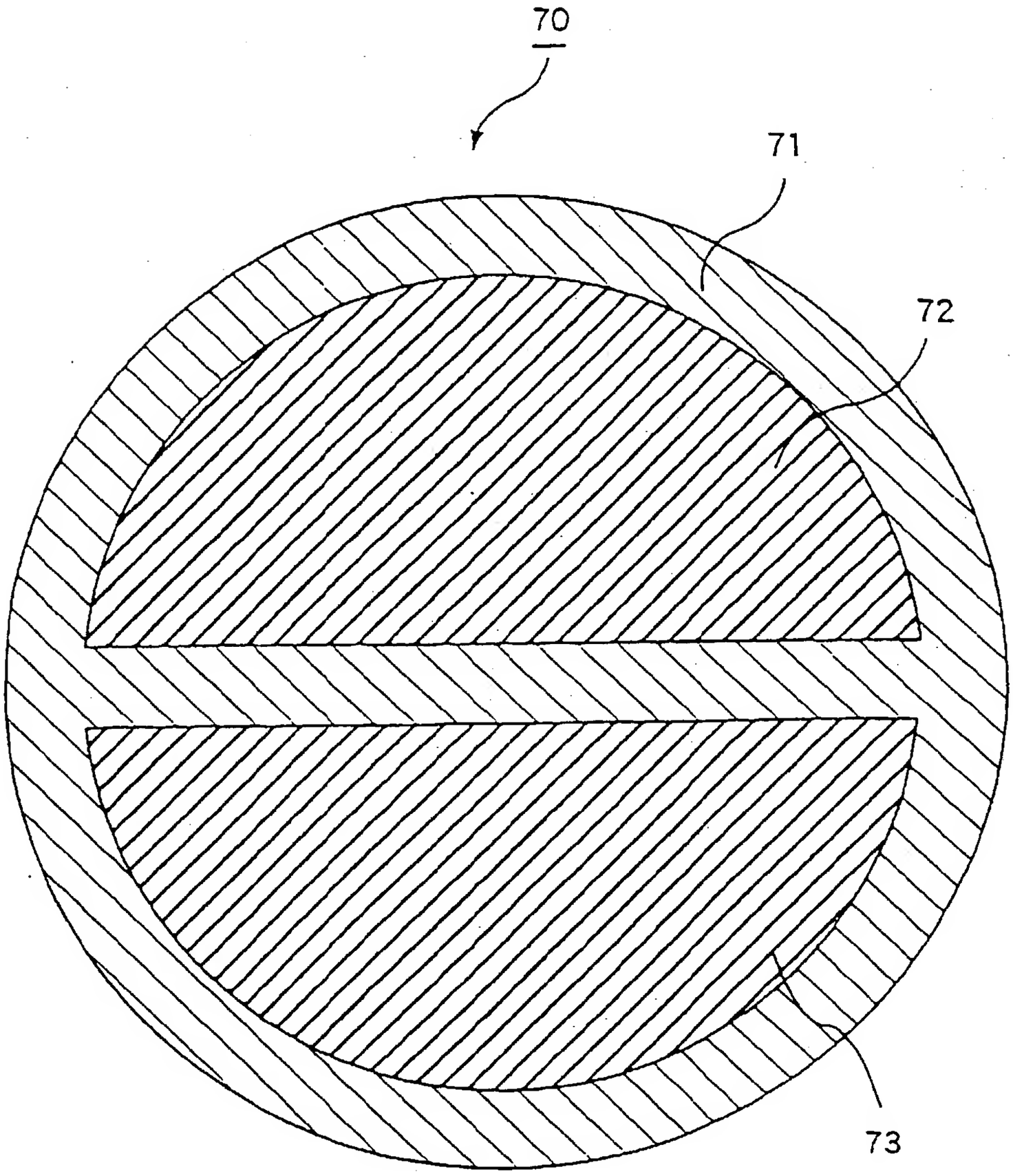


Fig. 6

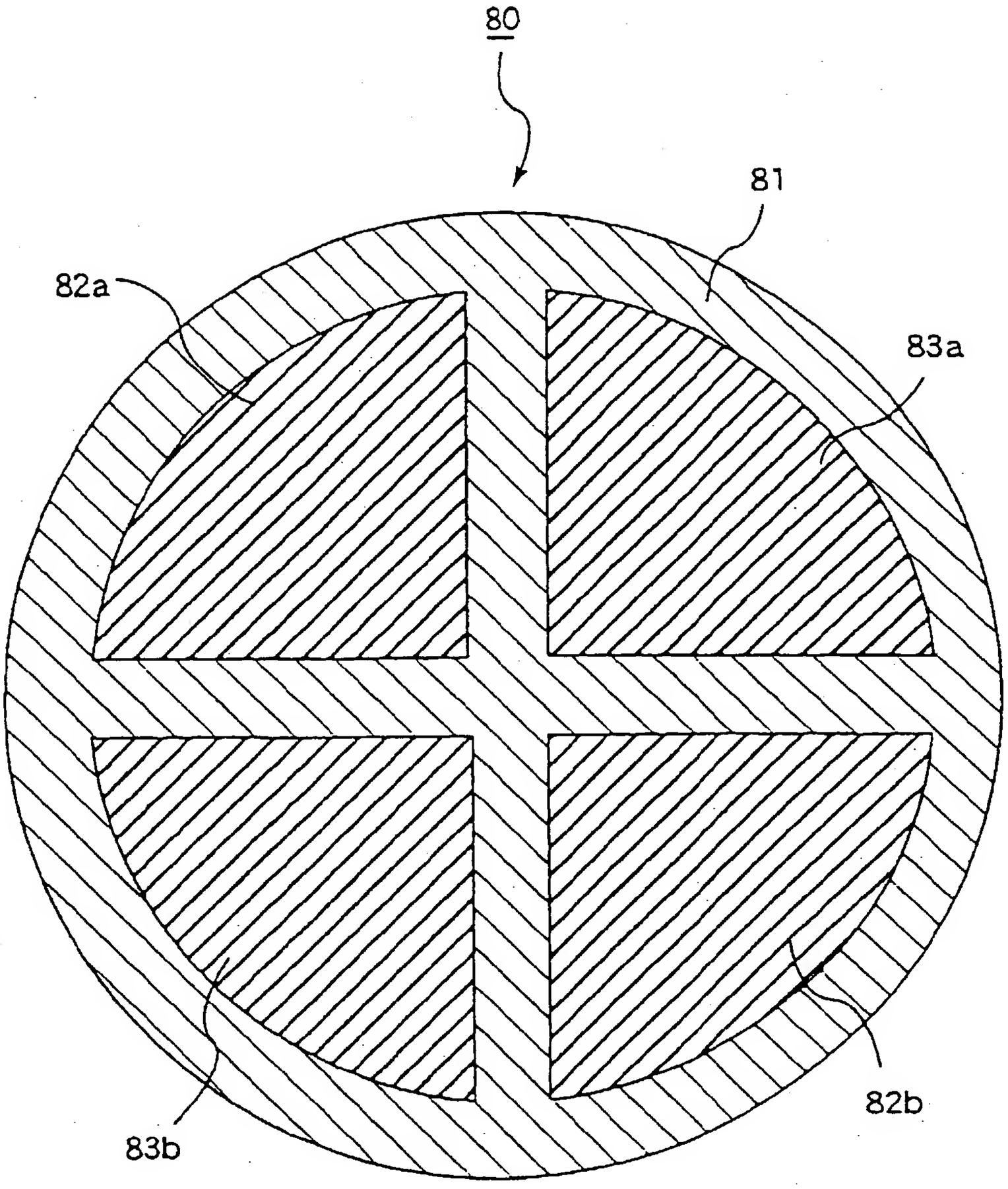


Fig. 7

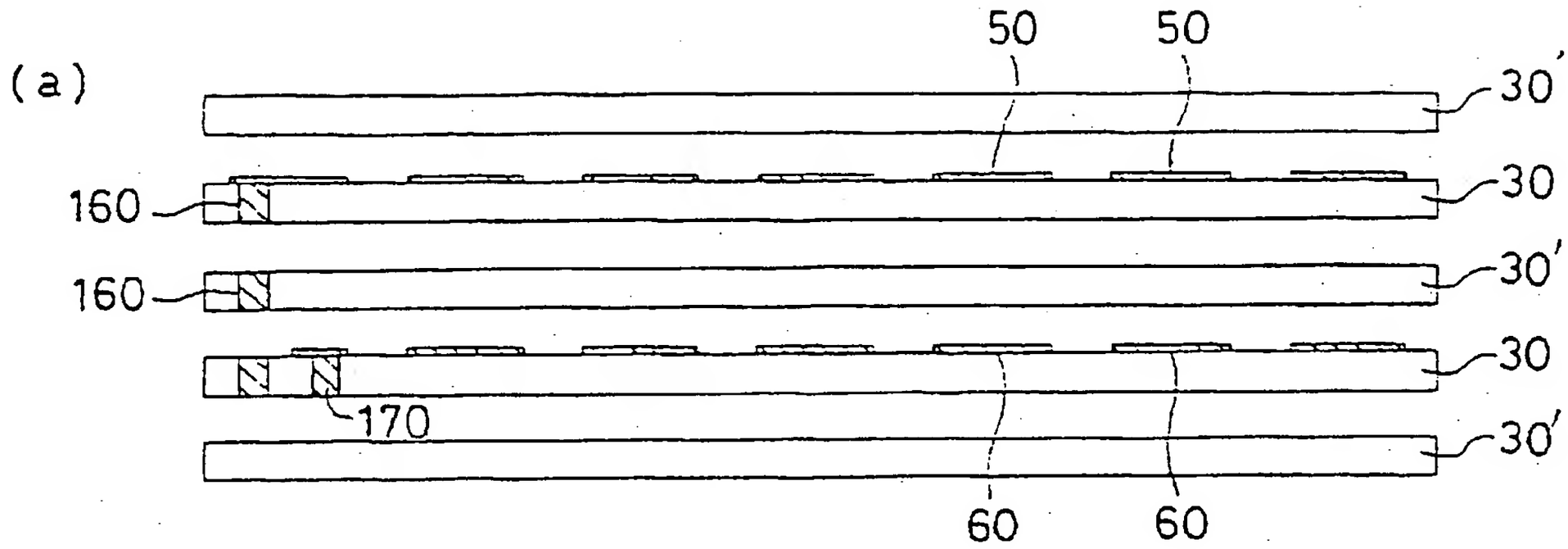
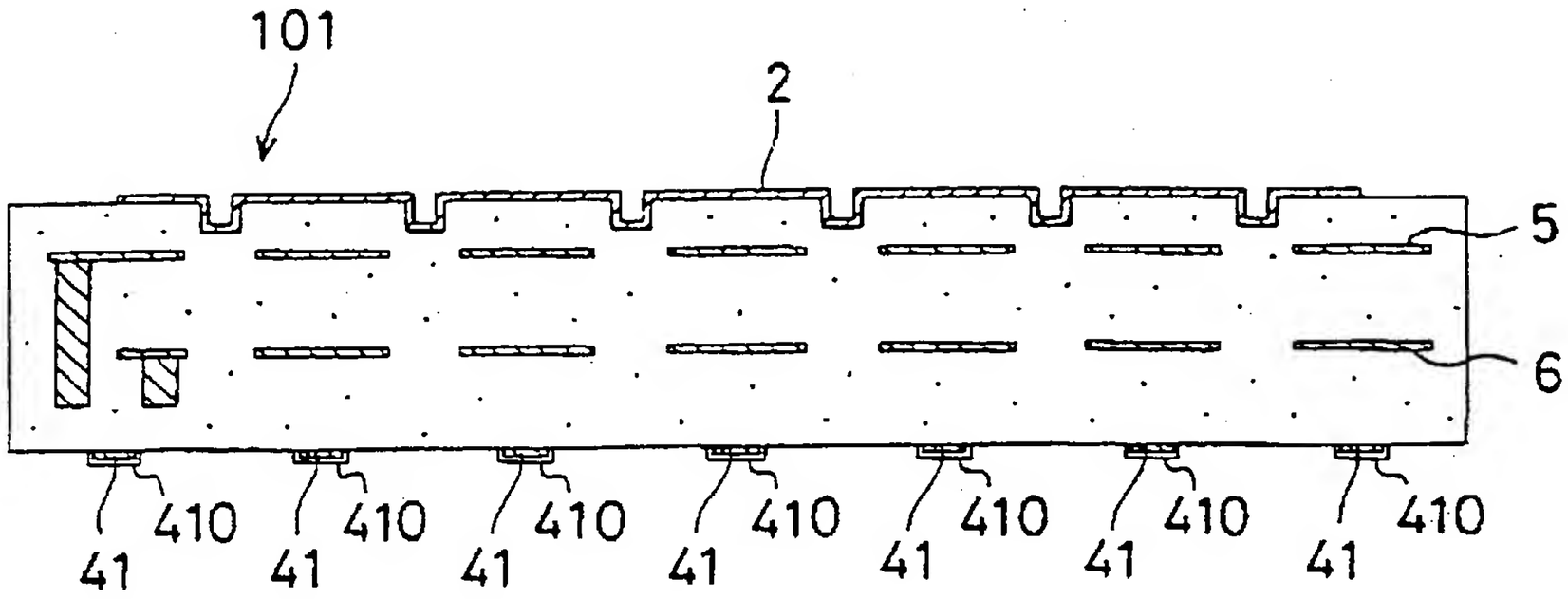
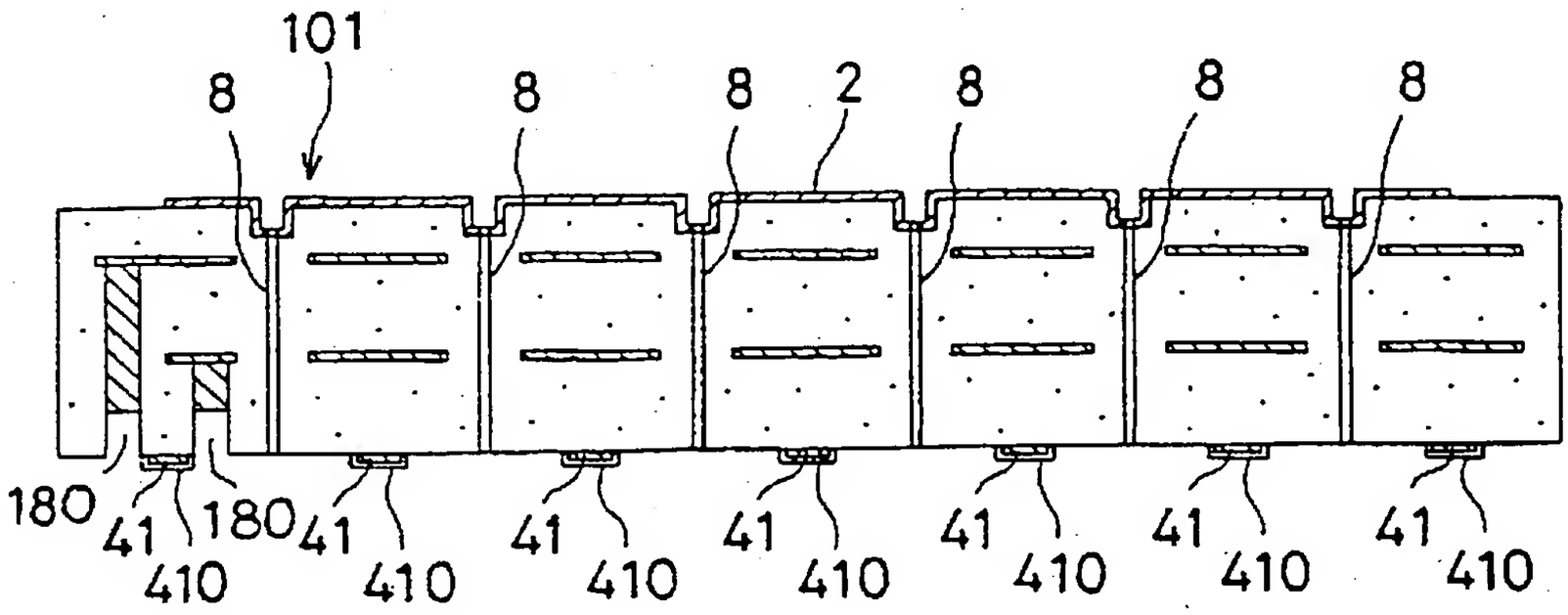

(a)
50
50
30'
160
30
160
30'
30
170
30'
60
60
(b)
1a
5
3
16
17
6
(c)
7
7
7
7
7
5
7
16
17
6
(d)
7
7
7
5
7
7
7
16
17
41
41
41
6
41
41
41
41

Fig. 8

(e)




(f)




(g)

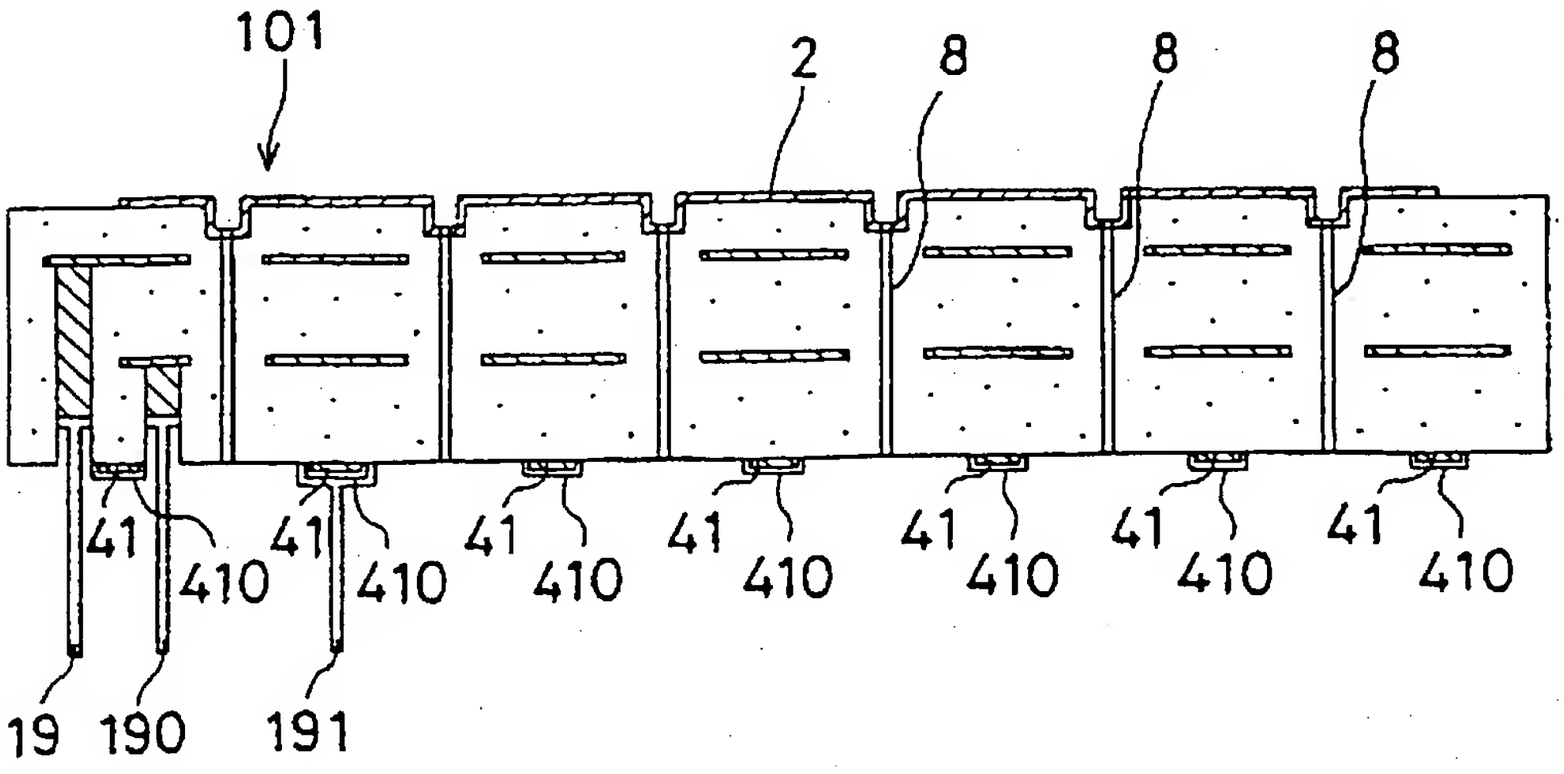


Fig. 9

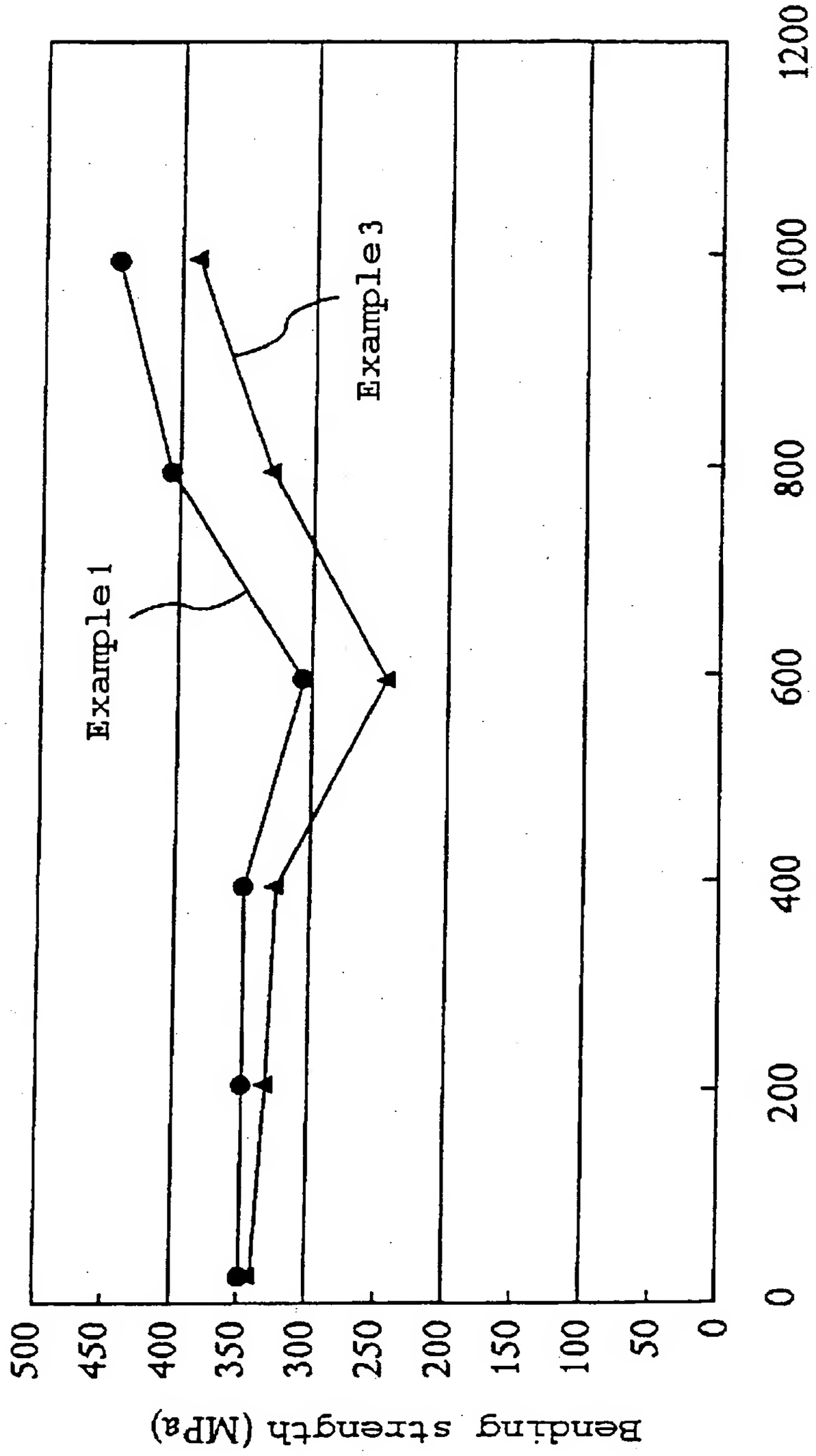

Example3
Example1
Bending strength (MPa)
500
450
400
350
300
250
200
150
100
50
0
Temperature (°C)
0
200
400
600
800
1000
1200

Fig. 10

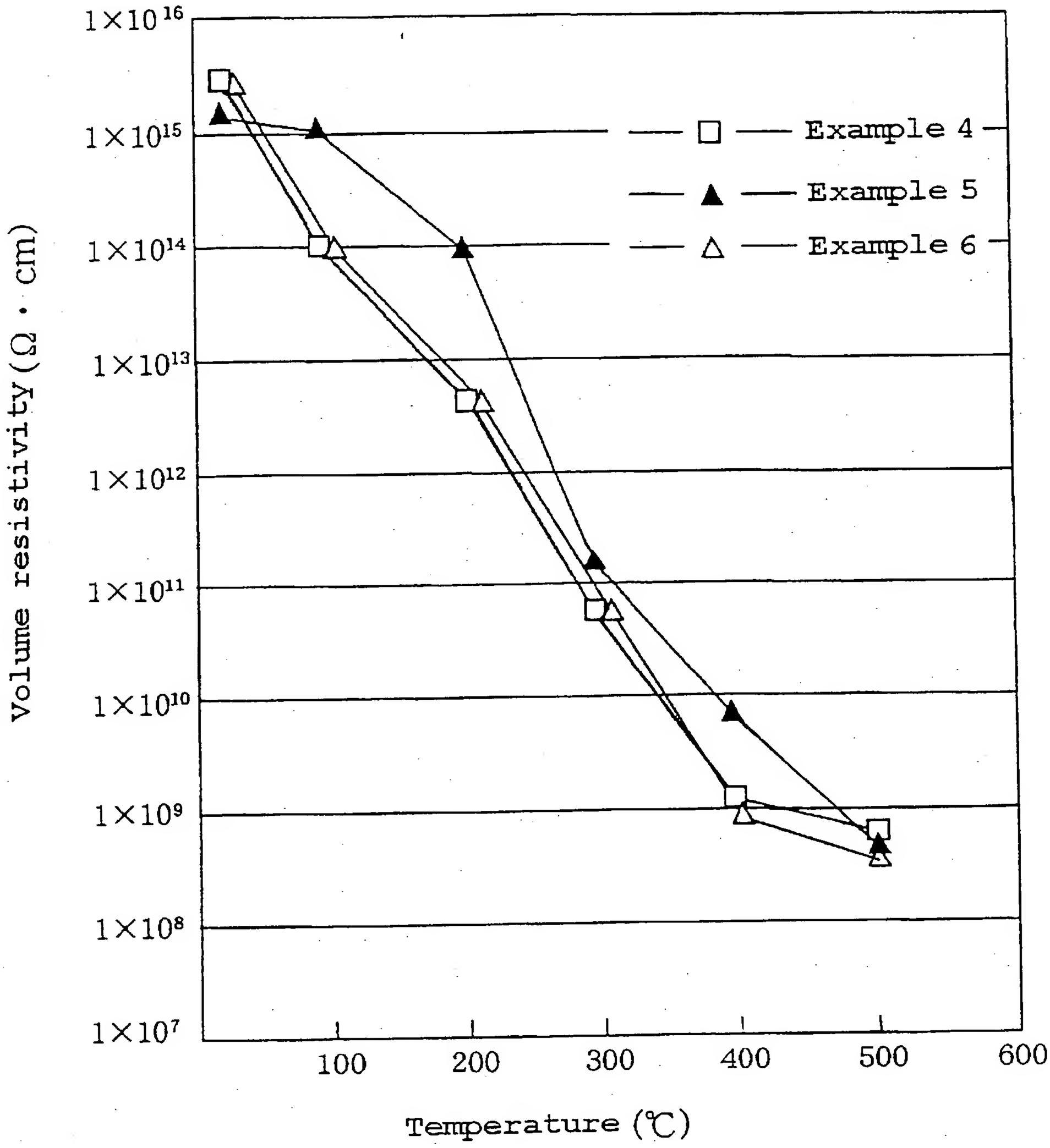

1×10¹⁶
1×10¹⁵
1×10¹⁴
1×10¹³
1×10¹²
1×10¹¹
1×10¹⁰
1×10⁹
1×10⁸
1×10⁷
Volume resistivity (Ω・cm)
Example 4
Example 5
Example 6
100
200
300
400
500
600
Temperature (℃)

Fig. 11

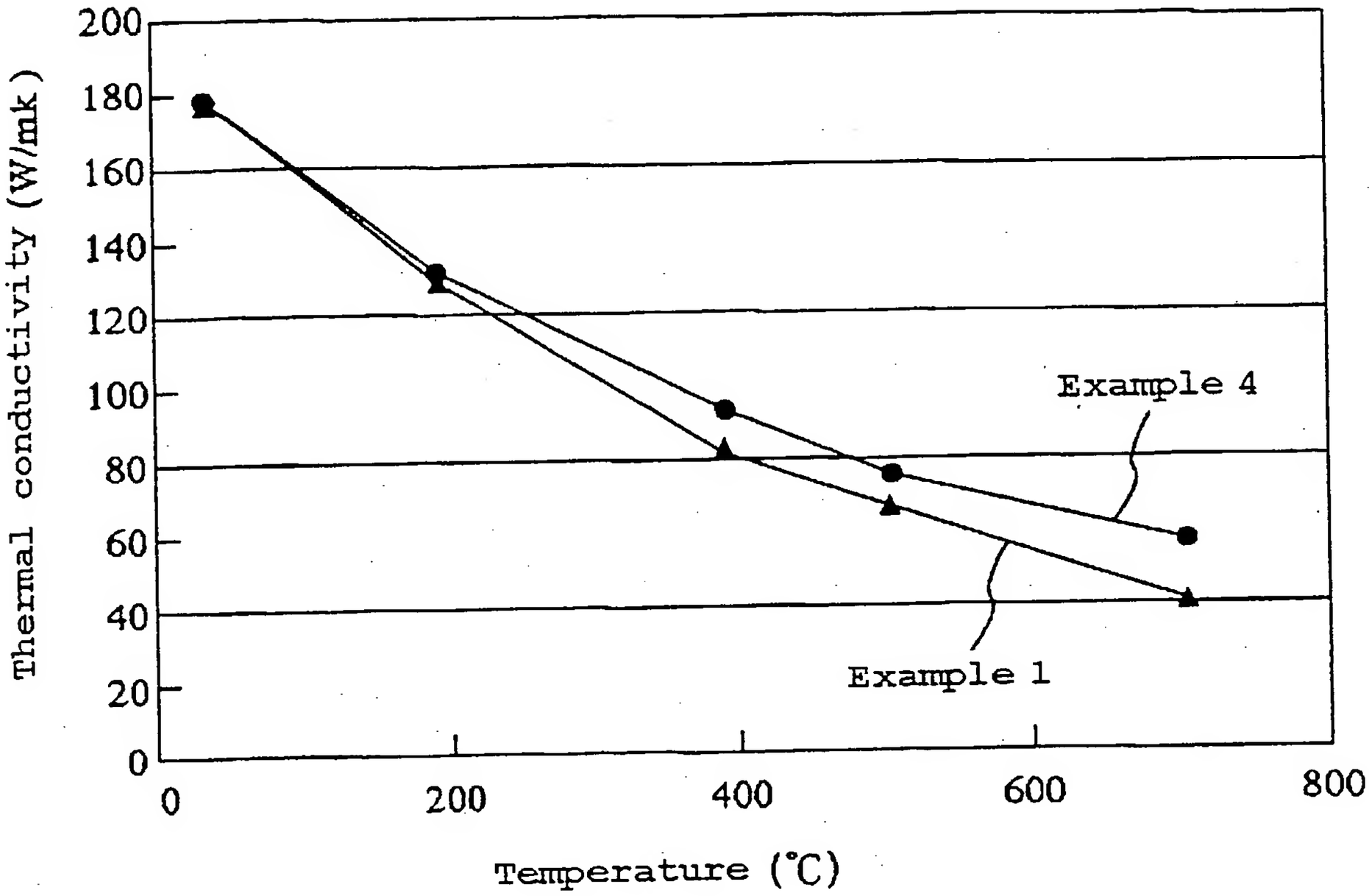

Thermal conductivity (W/mk)
200
180
160
140
120
100
80
60
40
20
0
0
200
400
600
800
Temperature (°C)
Example 4
Example 1

Fig. 12

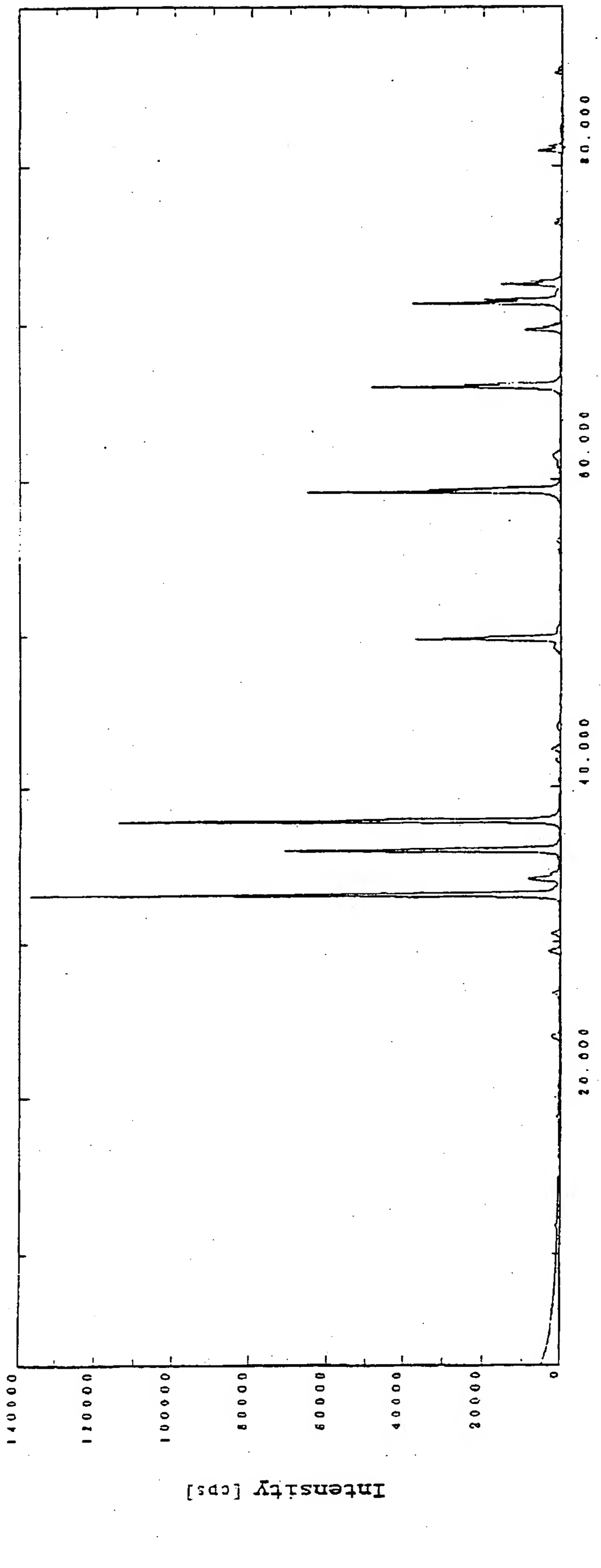

Intensity [cps]
140000
120000
100000
80000
60000
40000
20000
0
20.000
40.000
60.000
80.000
2θ [°]
Sample name : Inside
File : T990603.0340
Comments : Wide angle measurement
Date of measurement : 03-Jun-99 16:50
Measurer : R I N T
X-rays : Cu K-ALPHA1 / 50 kV / 300 mA
Goniometer : RINT 2000 wide angle goniometer
Attachment : Standard sample holder
Filter : Not used
Incident monochrome :
Counter monochrometer : Full automatic monochrometer
Divergent slit : "1deg."
scattering slit : "1deg."
Light-receiving slit : "0.3mm"
Counter: Scintillation counter
Scanning mode: Continuous
Scanning speed: 2000° /min.
Scanning step: 0.020°
Scanning axis: 2θ/θ
scanning range: 3.000-90.000°
Scanning mode: Continuous
θ offset: 0.000°

Fig. 13

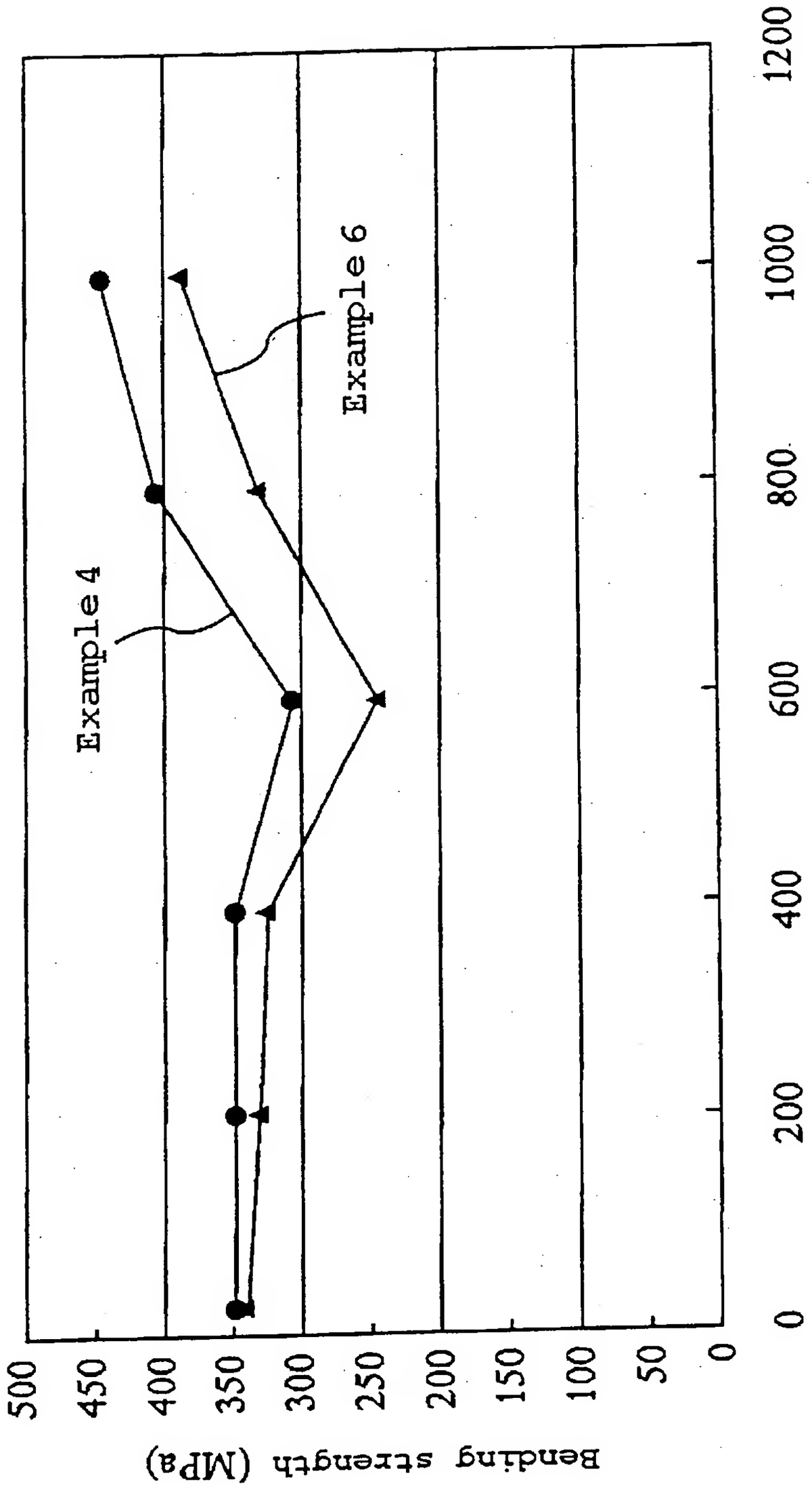

Example 6
Example 4
Bending strength (MPa)
500
450
400
350
300
250
200
150
100
50
0
Temperature (°C)
0
200
400
600
800
1000
1200

Fig. 14

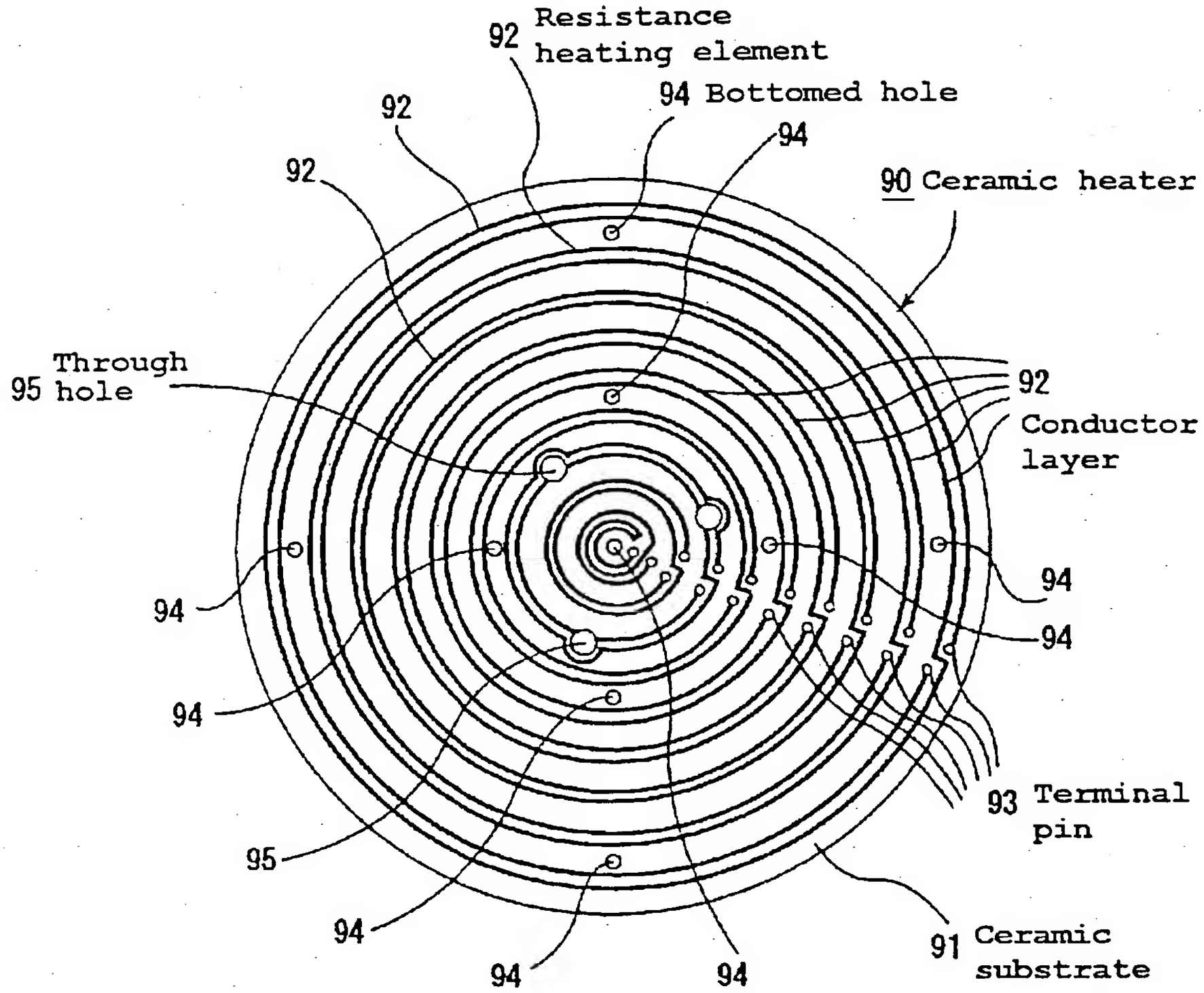

92
Resistance heating element
94 Bottomed hole
92
94
92
90 Ceramic heater
Through hole
95
92
Conductor layer
94
94
94
94
95
94
94
94
93 Terminal pin
91 Ceramic substrate

Fig. 15

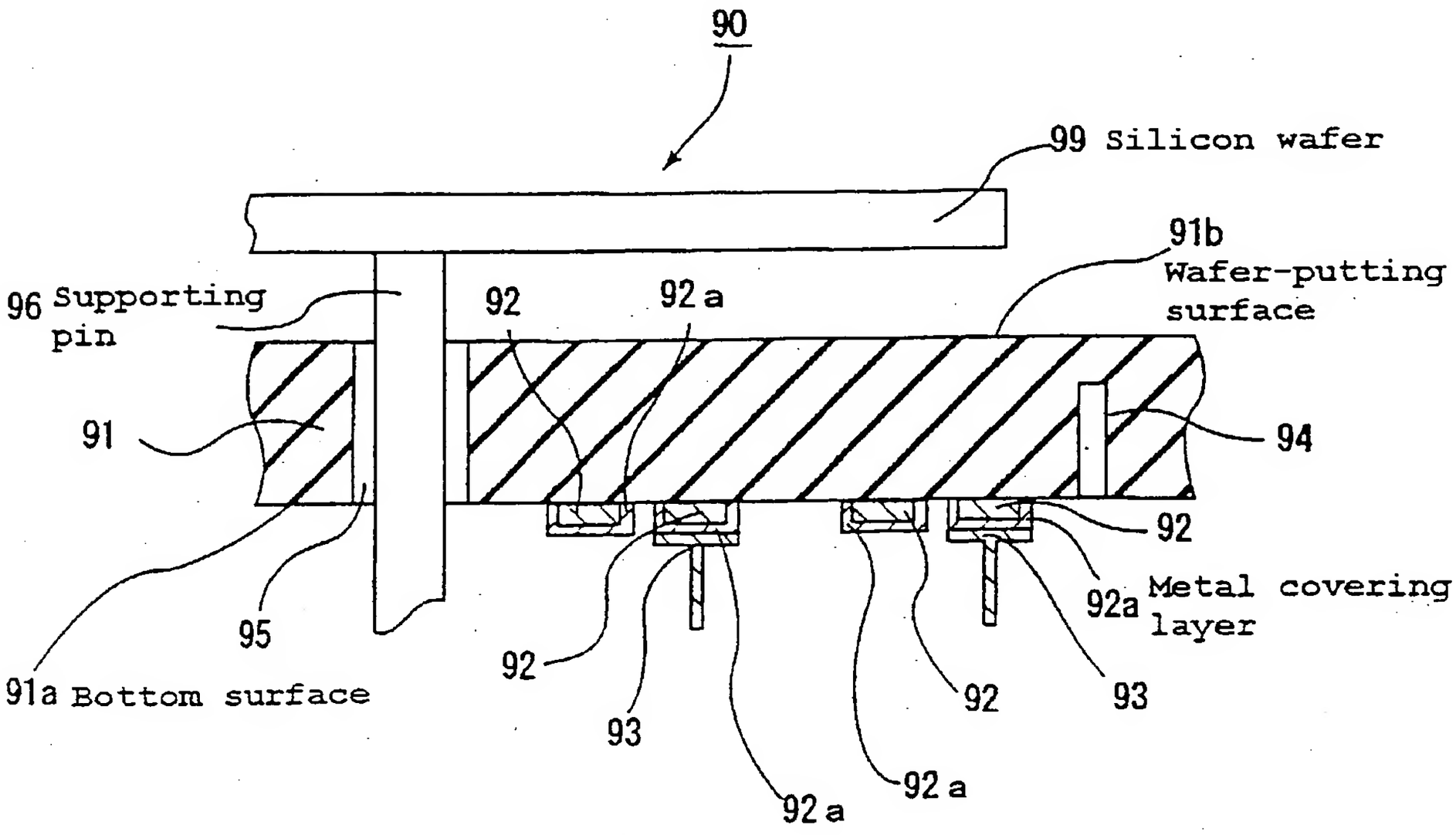

90
99 Silicon wafer
91b Wafer-putting surface
96 Supporting pin
92
92 a
91
94
92
95
92a Metal covering layer
91a Bottom surface
92
93
92
93
92 a
92 a

Fig. 16

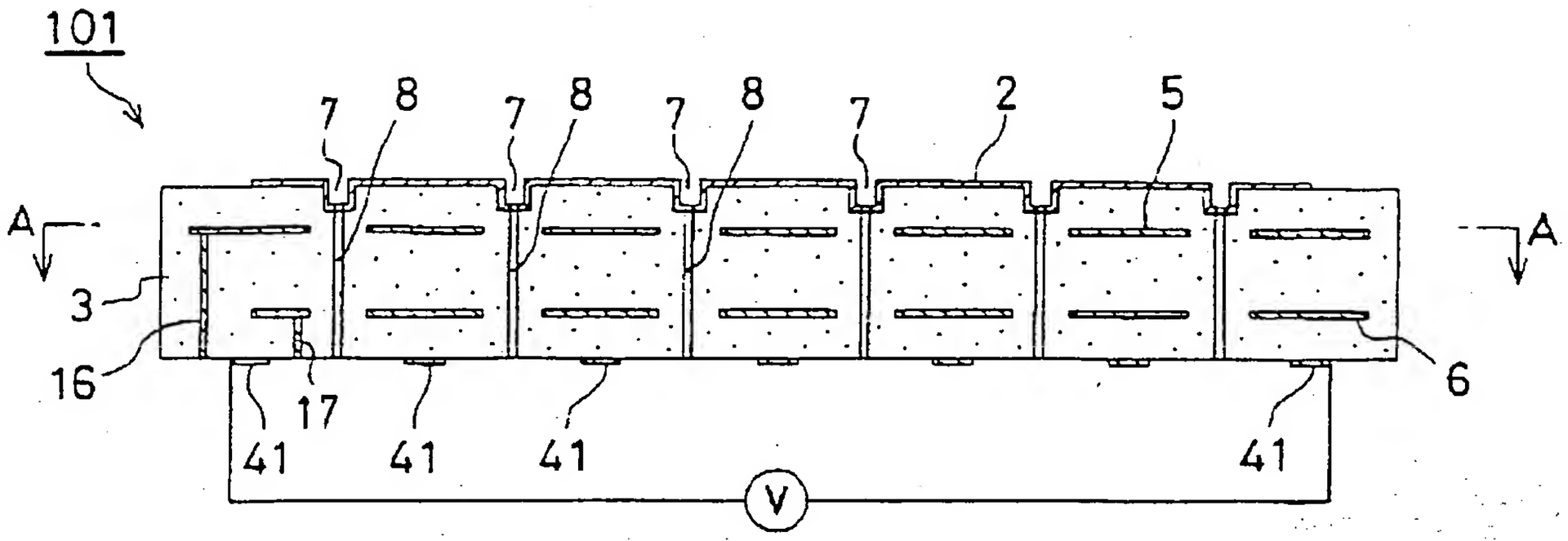



Fig. 17

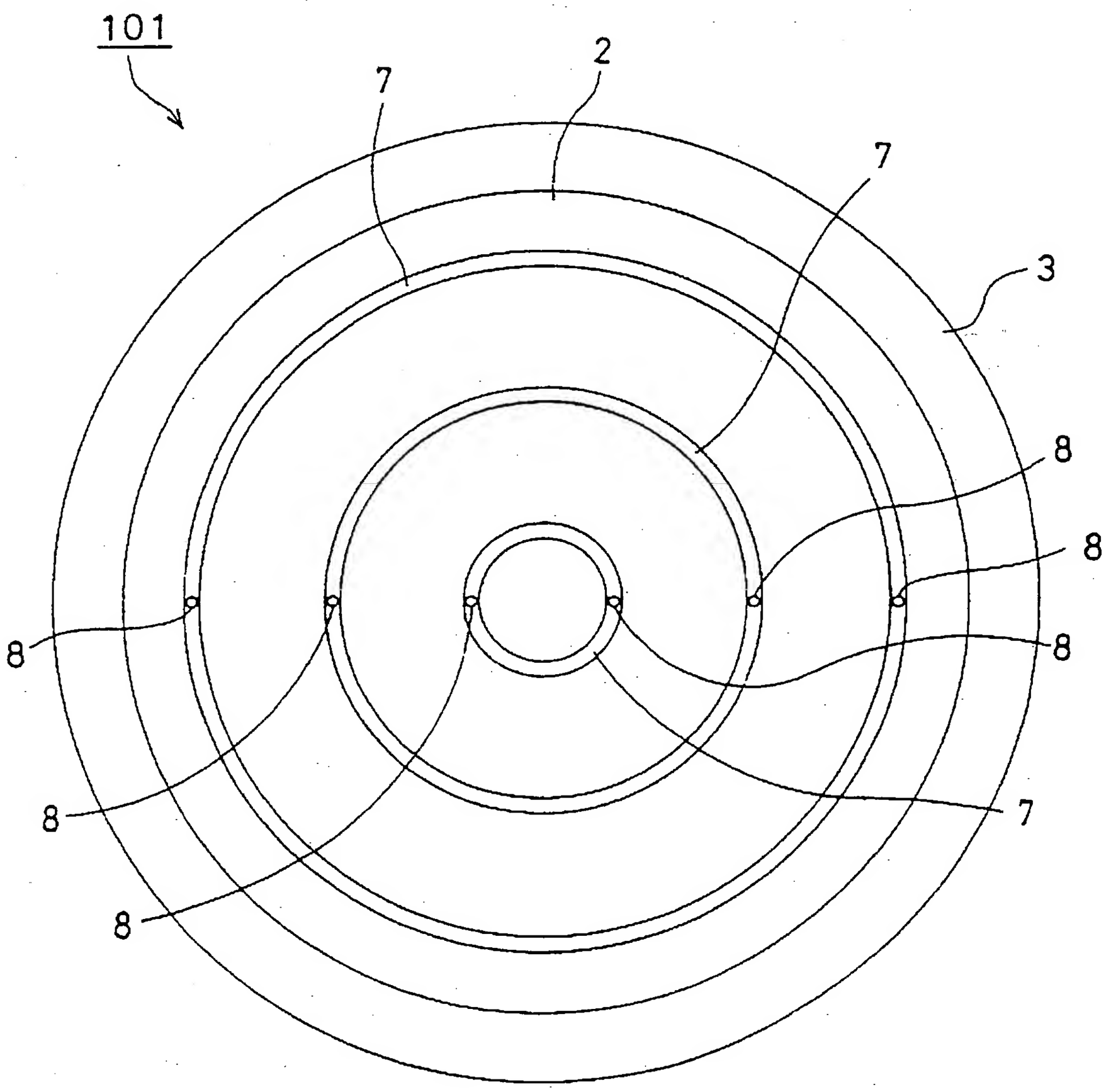


Fig. 18

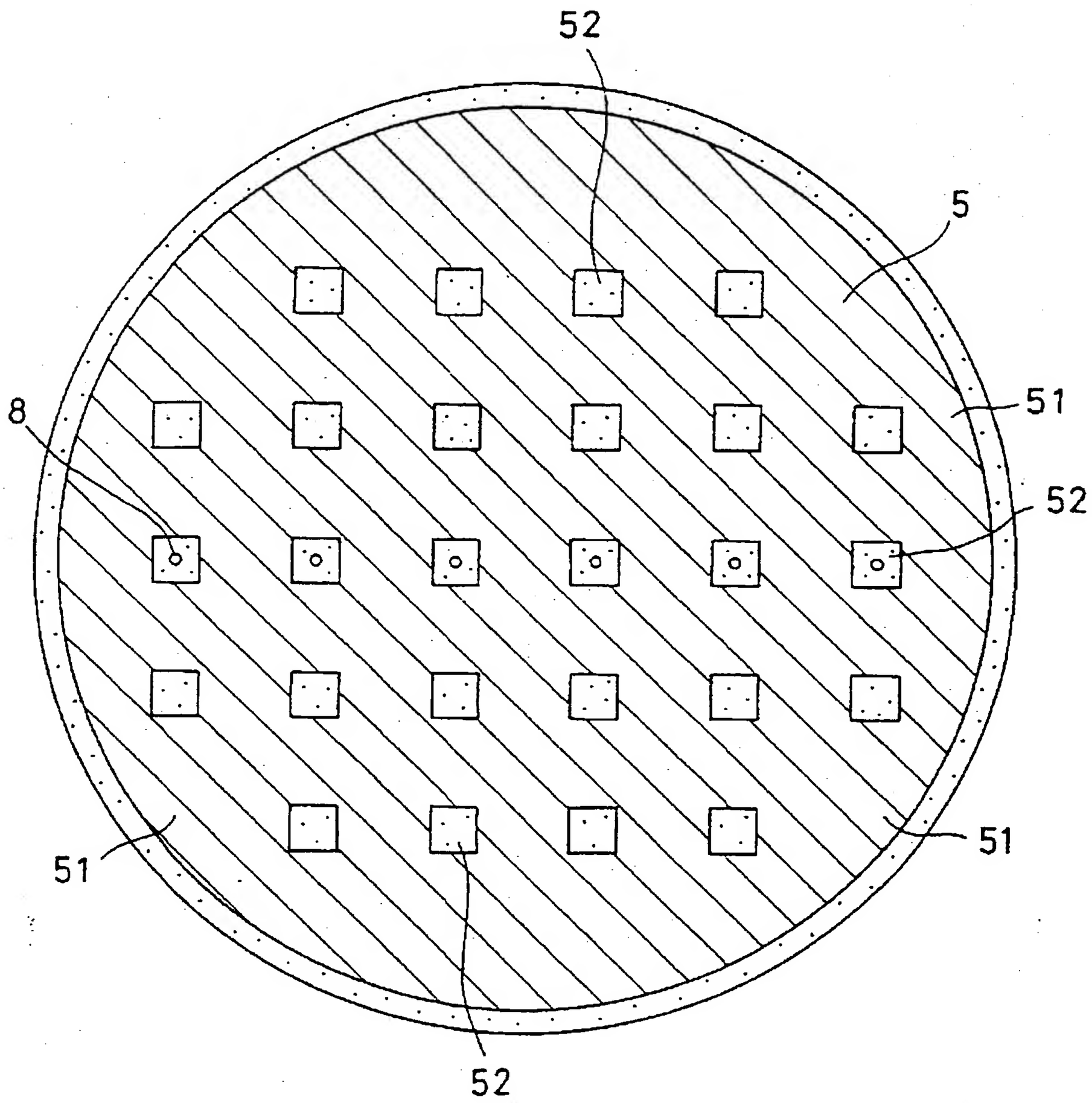


Fig. 1

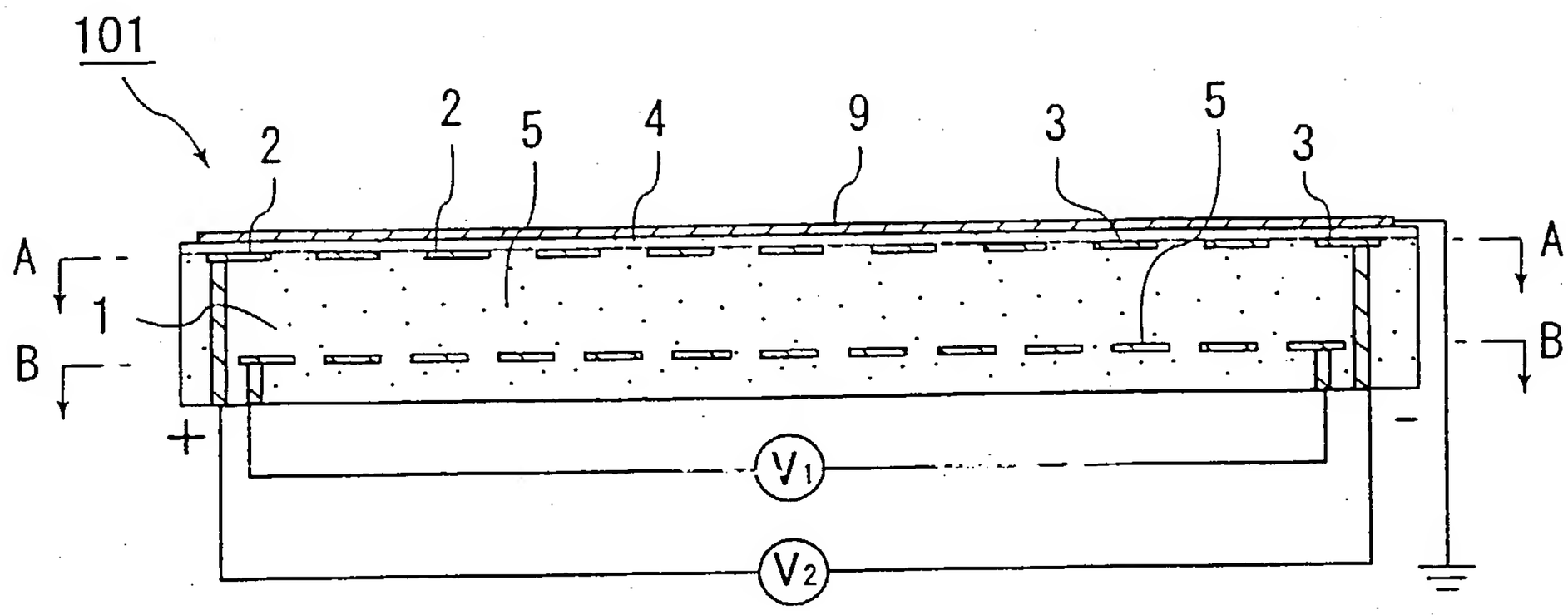



Fig. 2

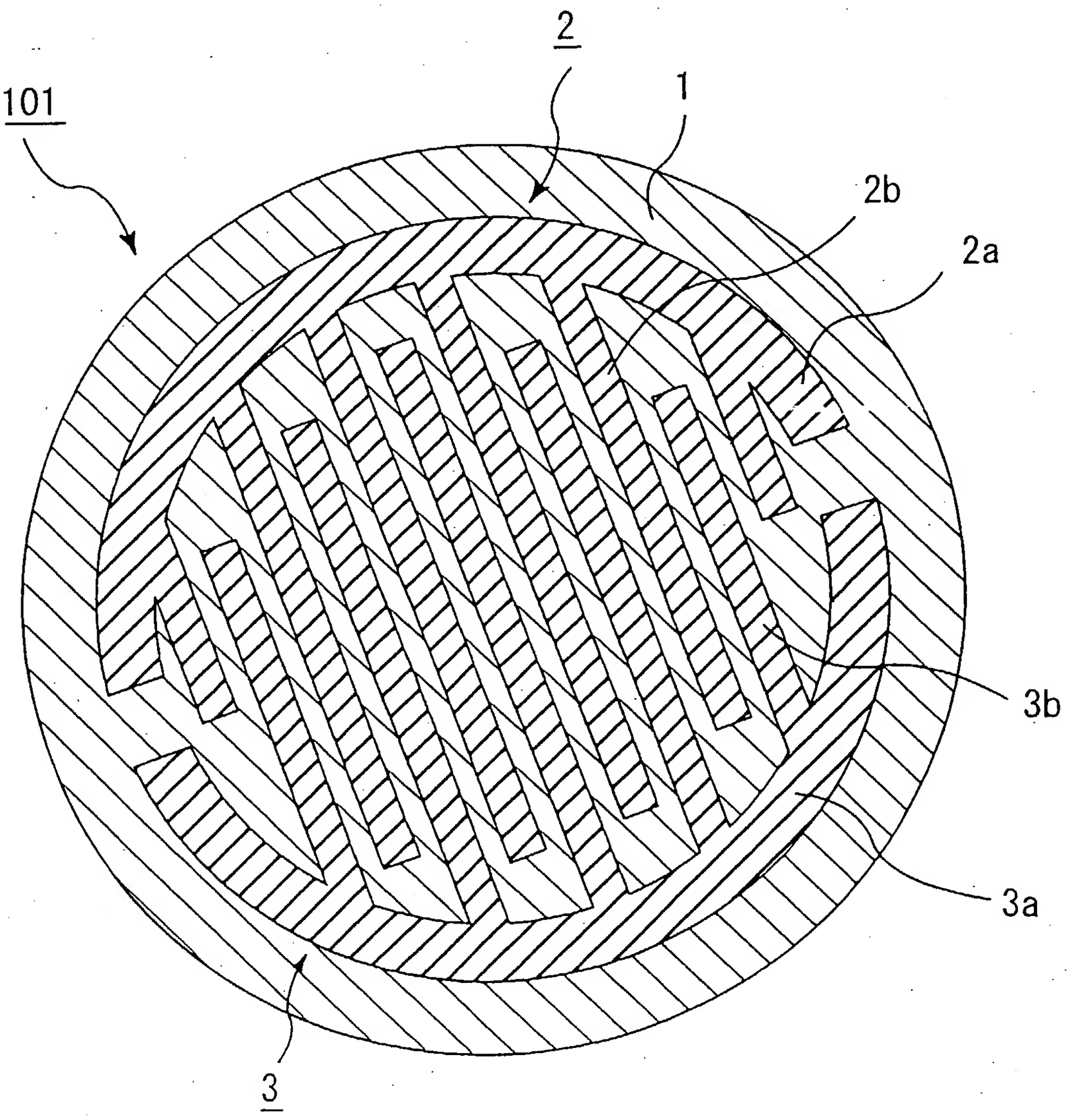


Fig. 3

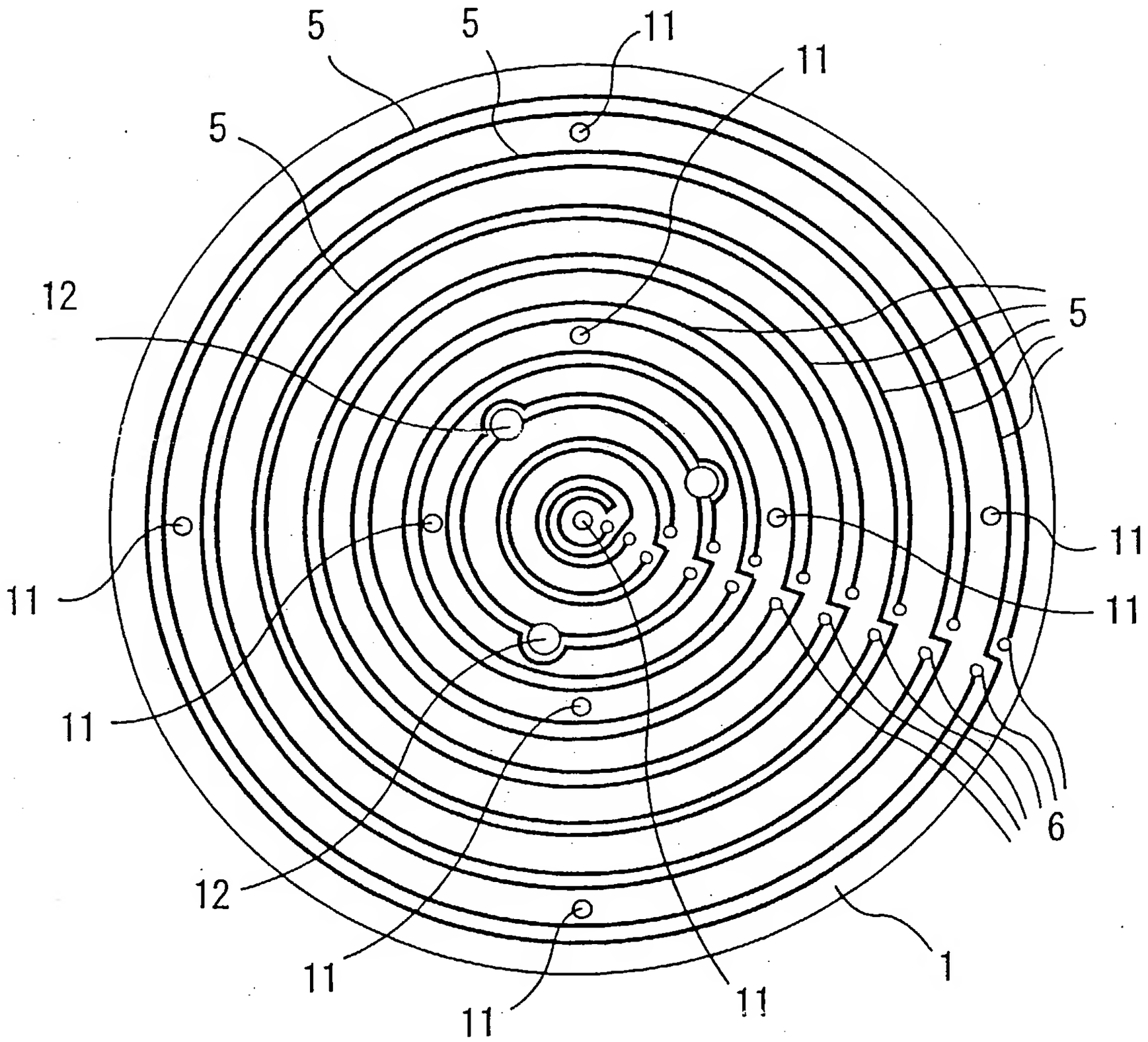


Fig. 4

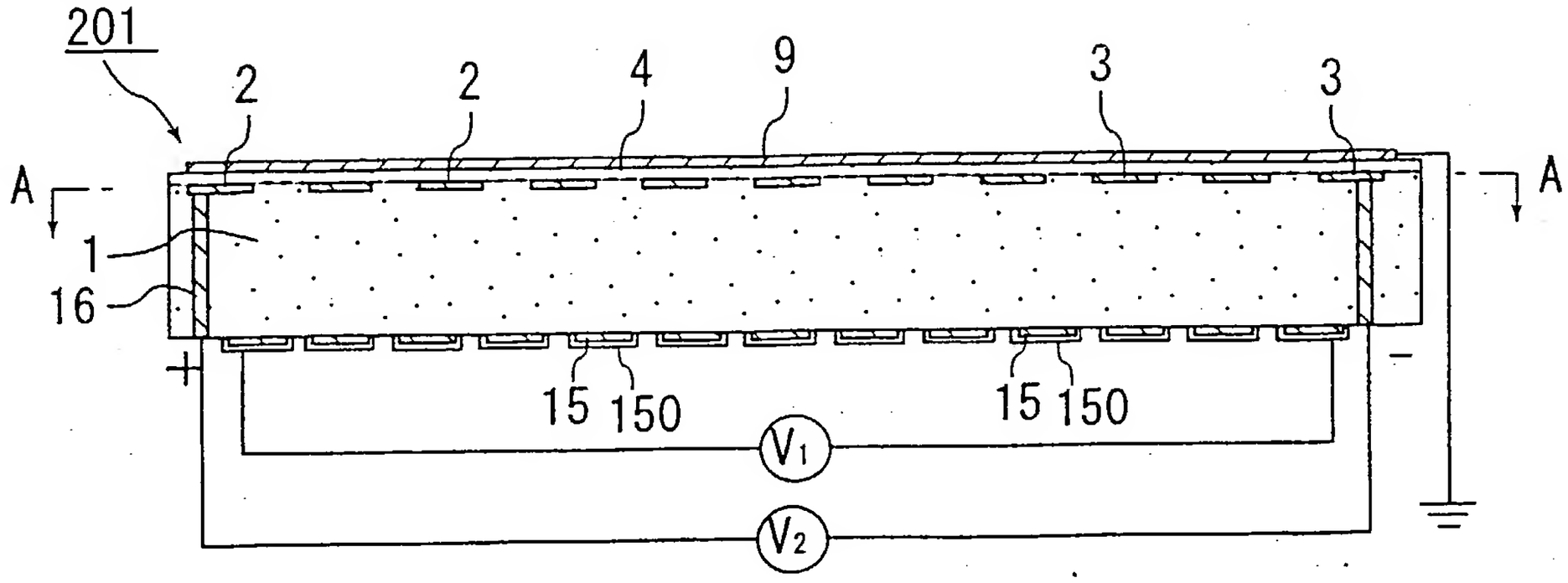



Fig. 5

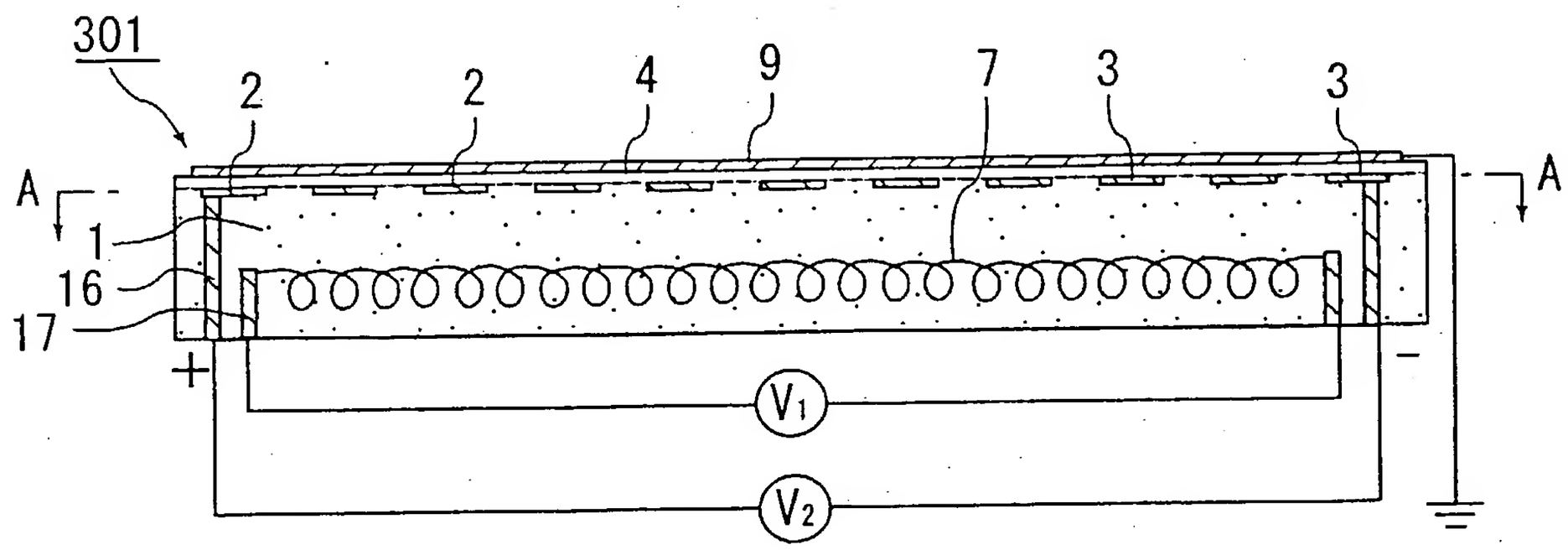



Fig. 6

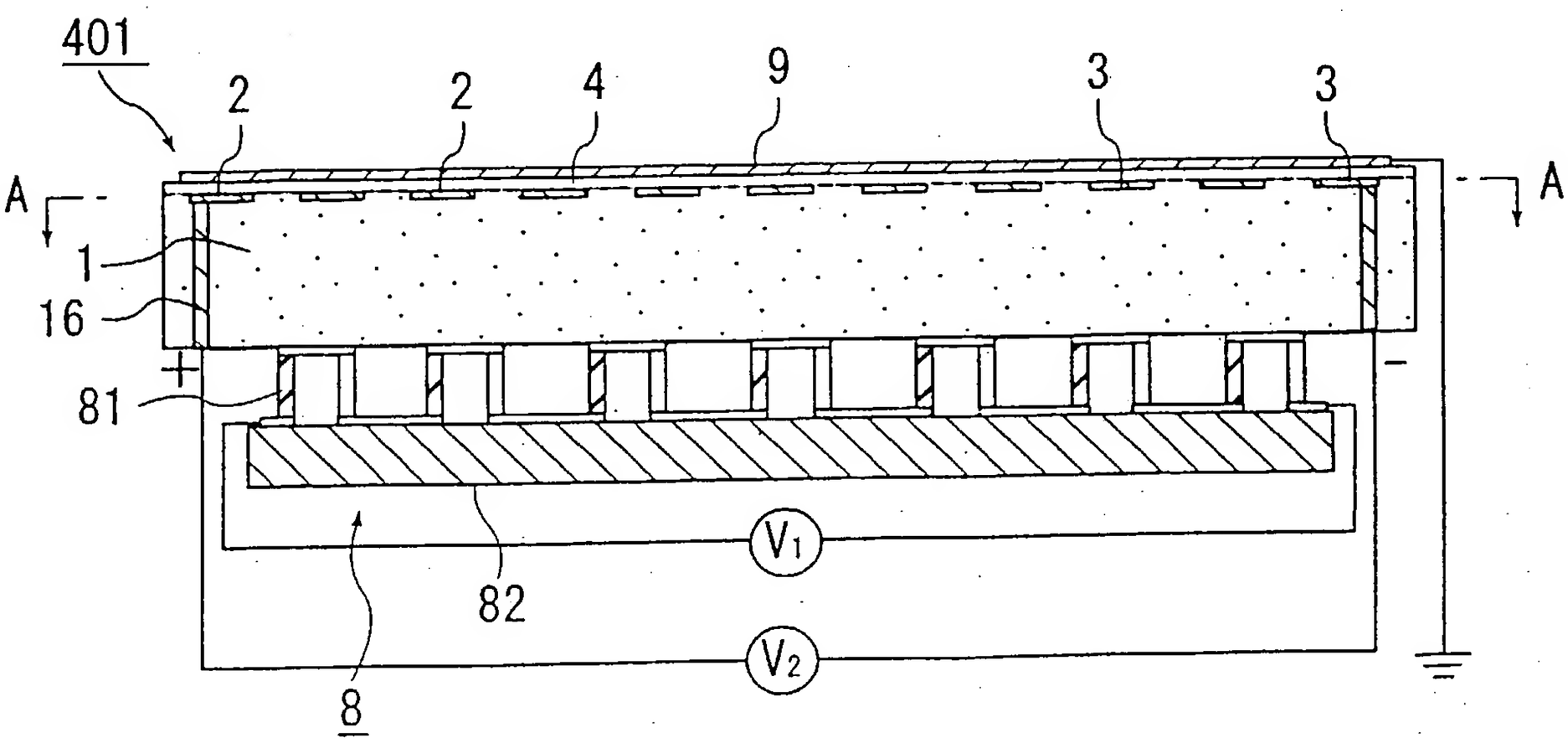


Fig.7

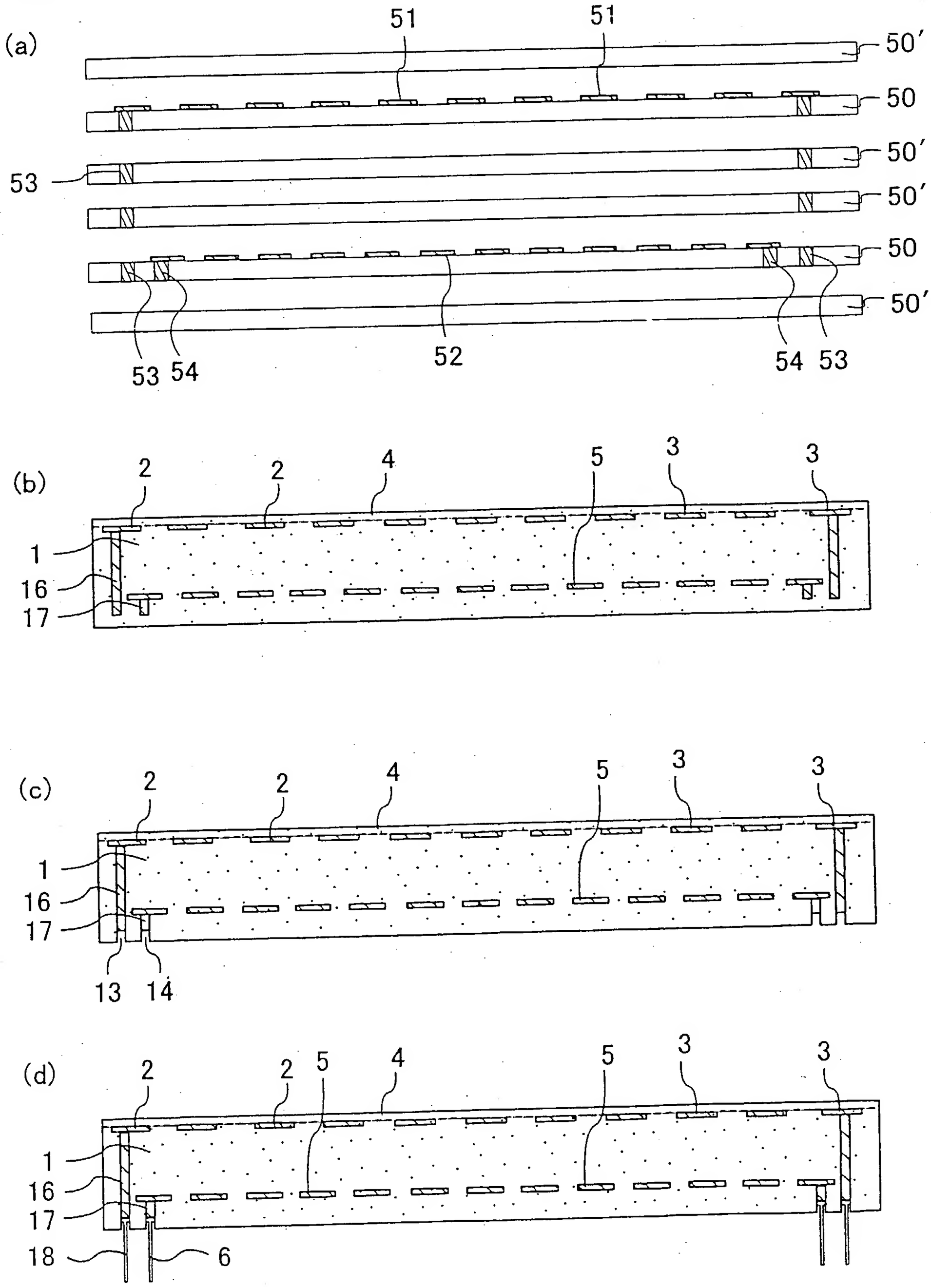

(a)
51
51
50′
50
50′
53
50′
50
50′
53
54
52
54
53
(b)
2
2
4
5
3
3
1
16
17
(c)
2
2
4
5
3
3
1
16
17
13
14
(d)
2
2
5
4
5
3
3
1
16
17
18
6

Fig. 8

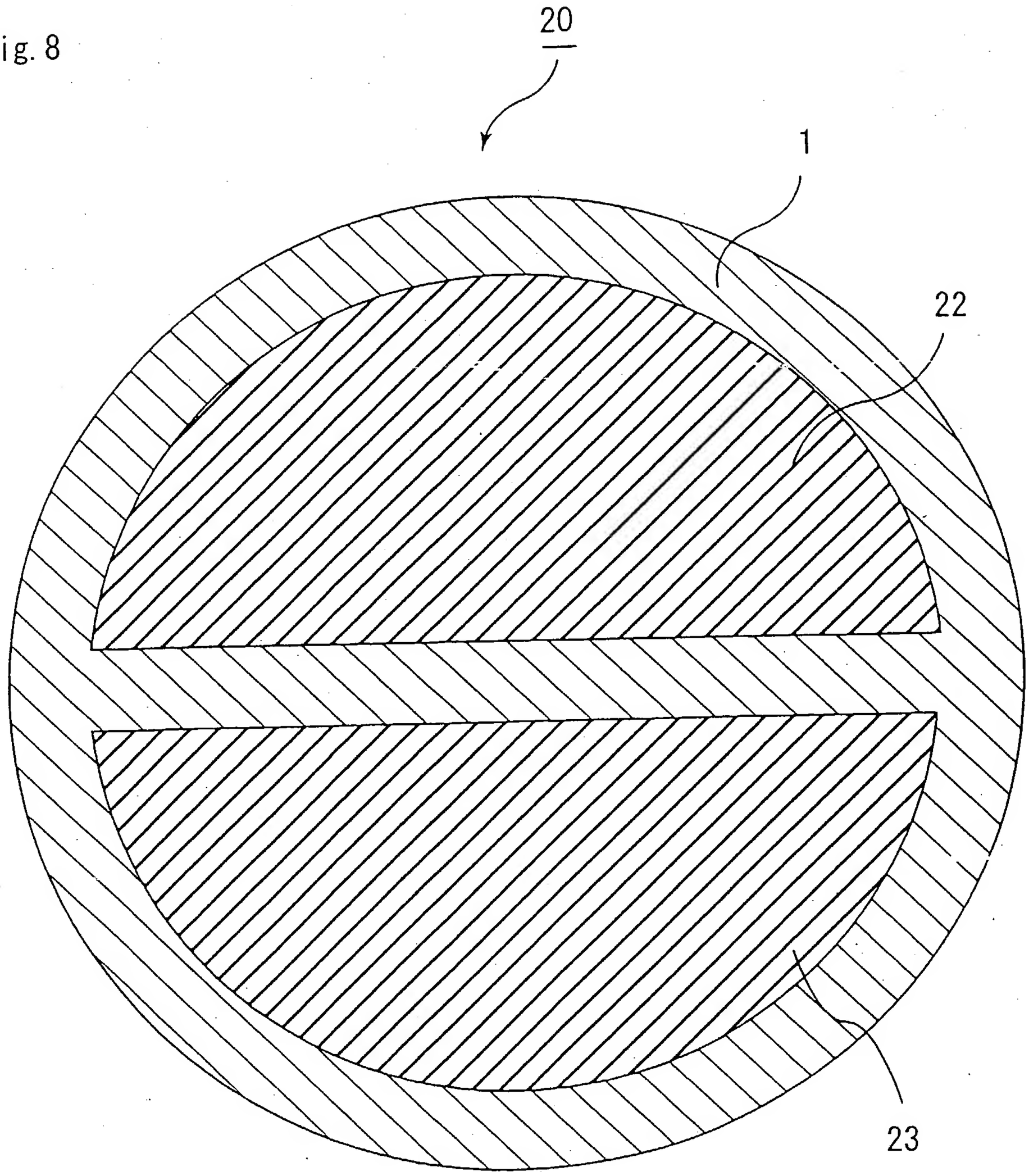


Fig. 9

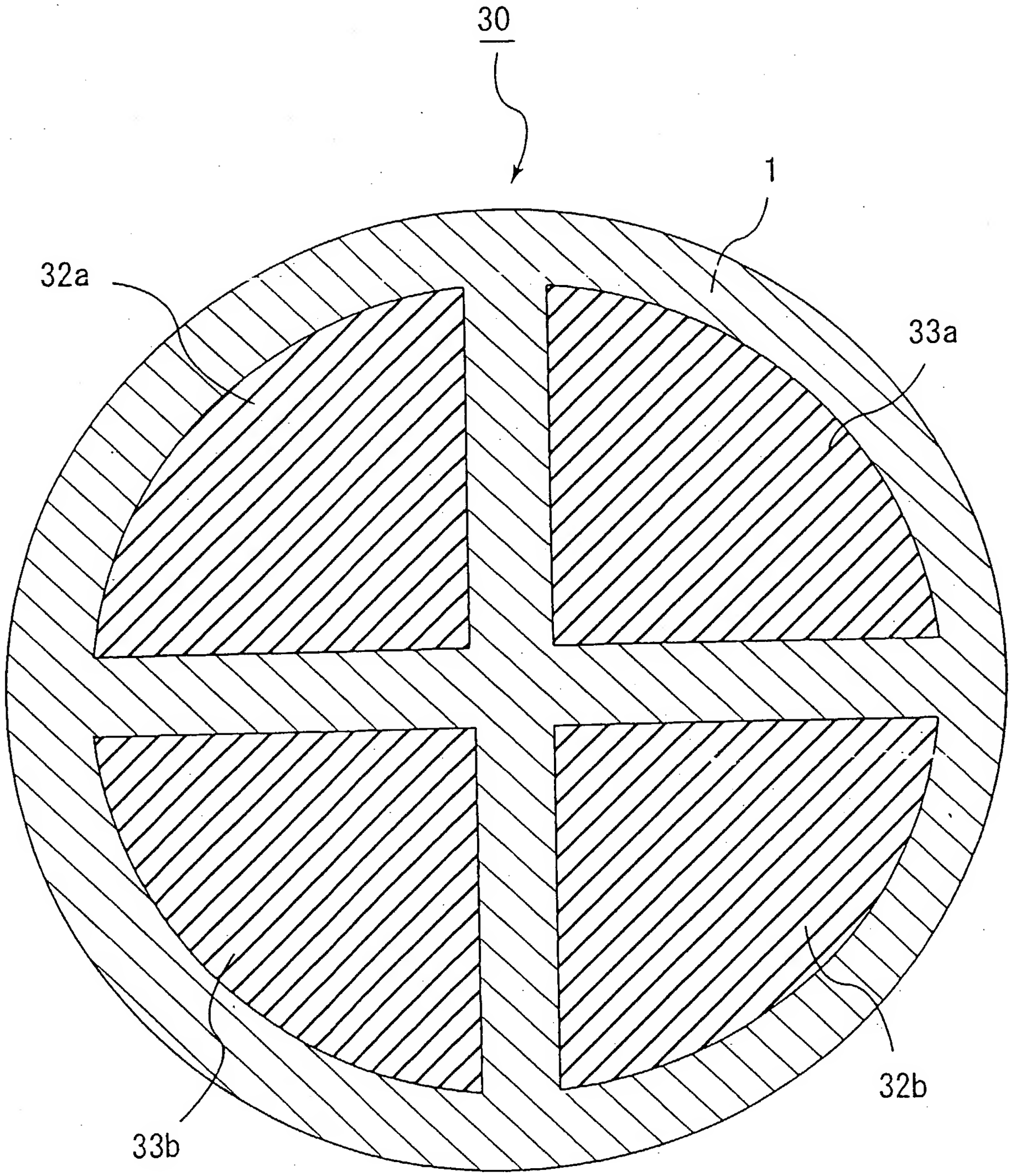


Fig. 10

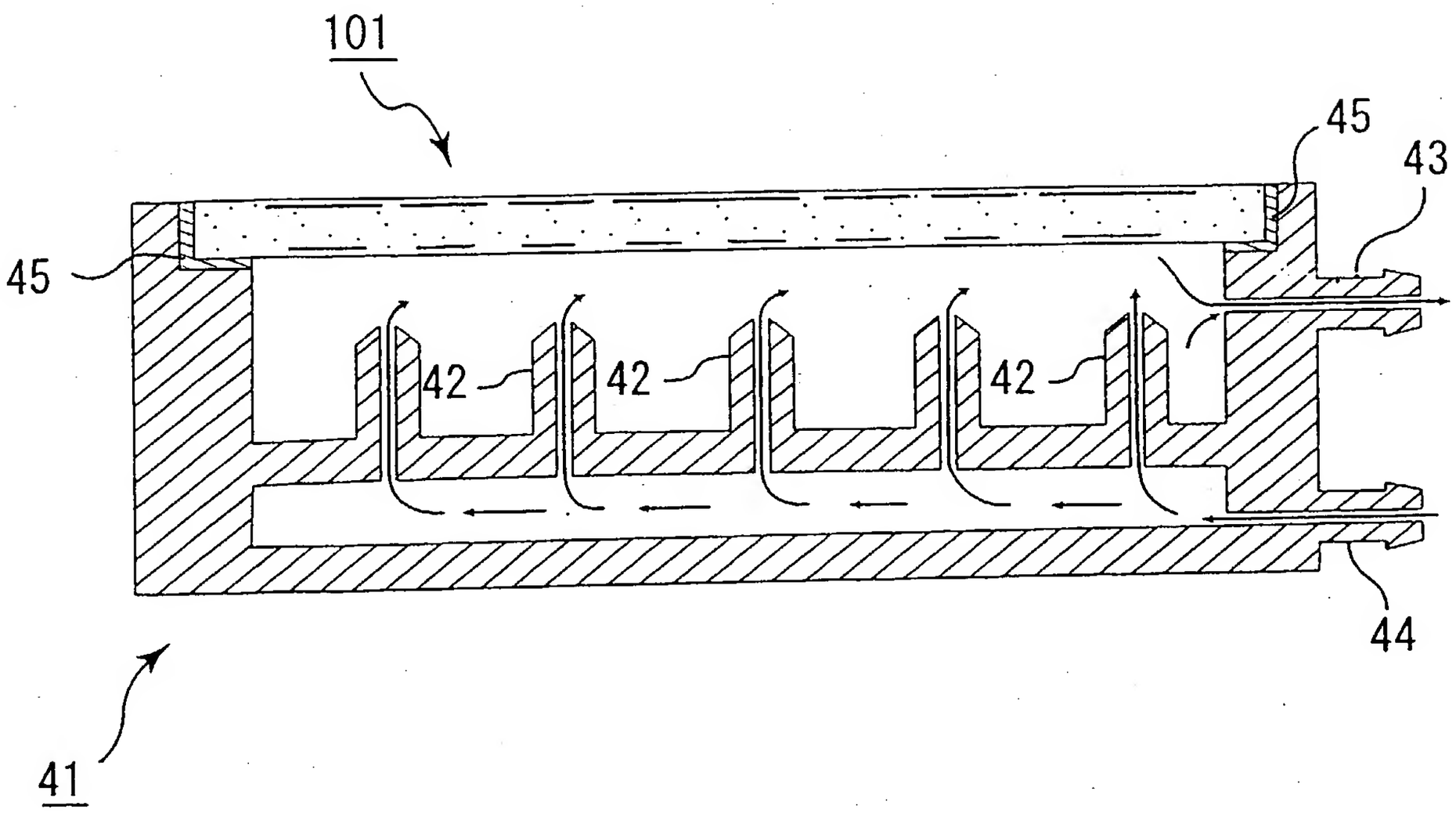


Fig. 11

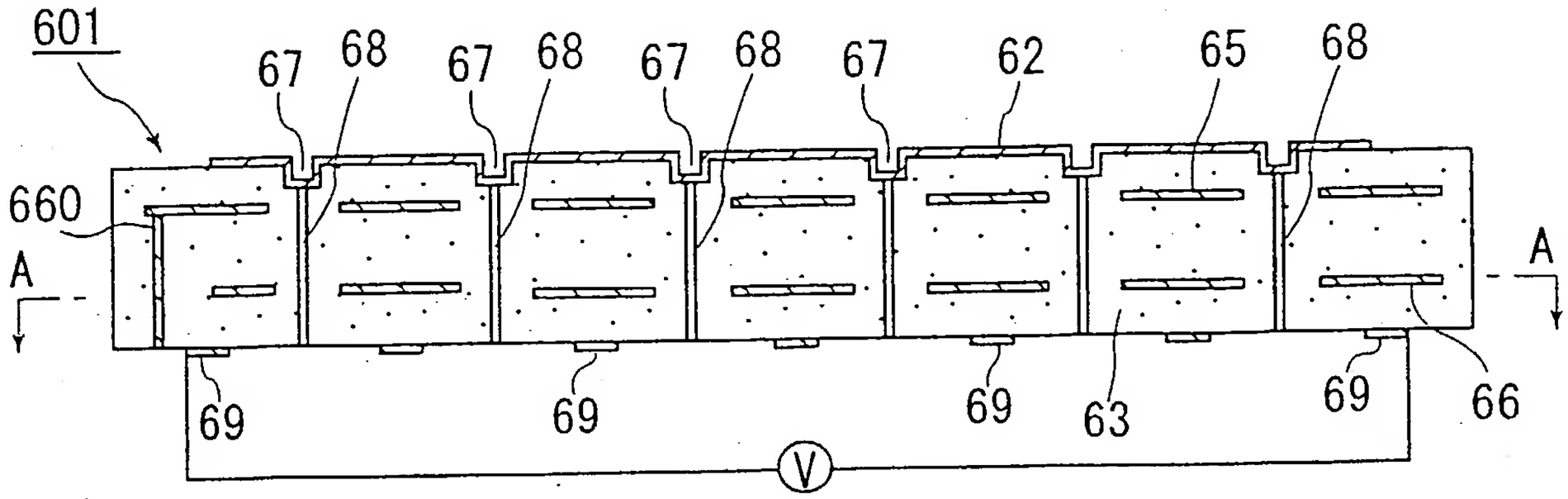

601
67
68
67
68
67
68
67
62
65
68
660
A
A
69
69
69
63
69
66
V

Fig. 12

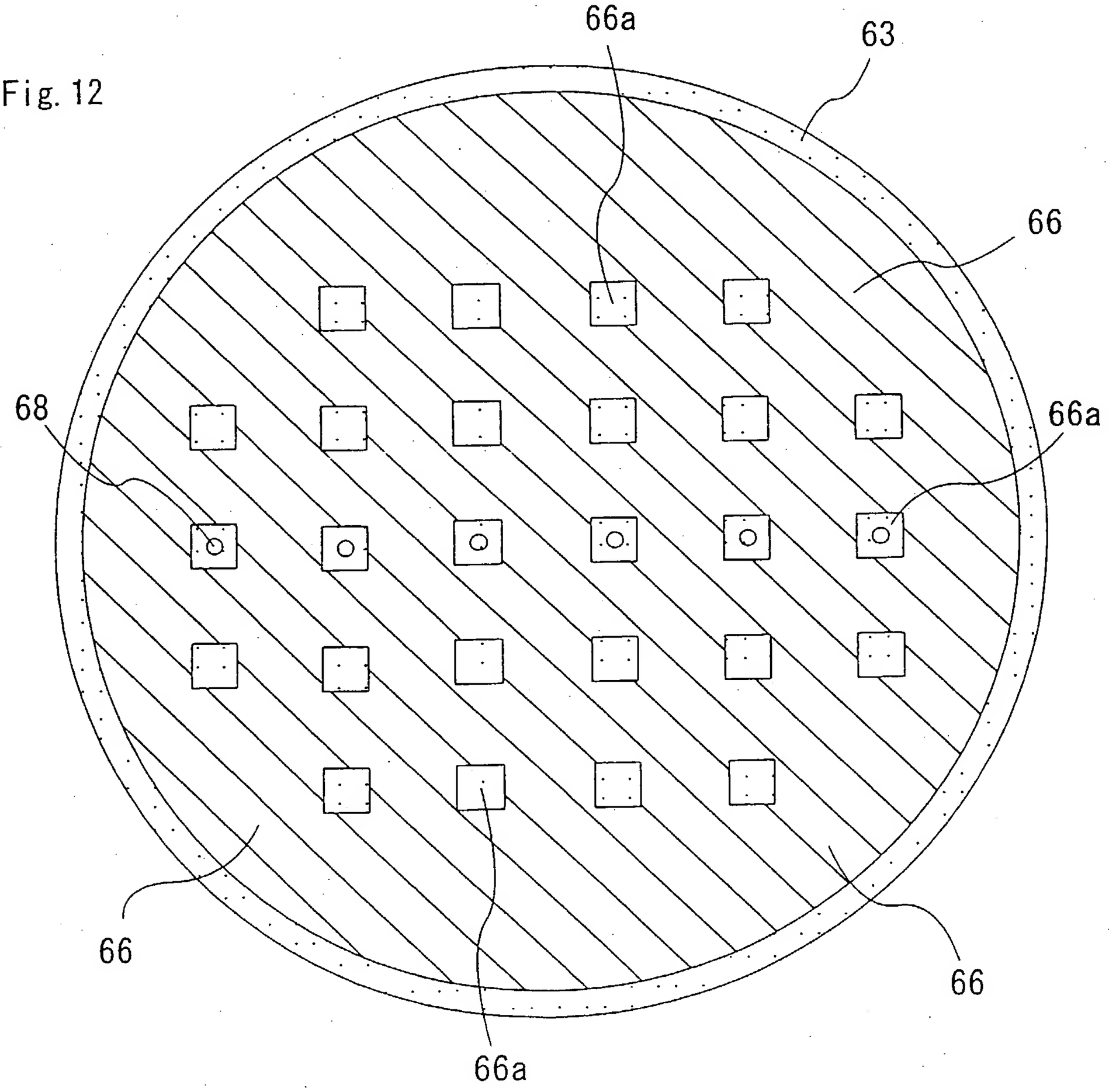

66a
63
66
68
66a
66
66
66a

Fig. 13

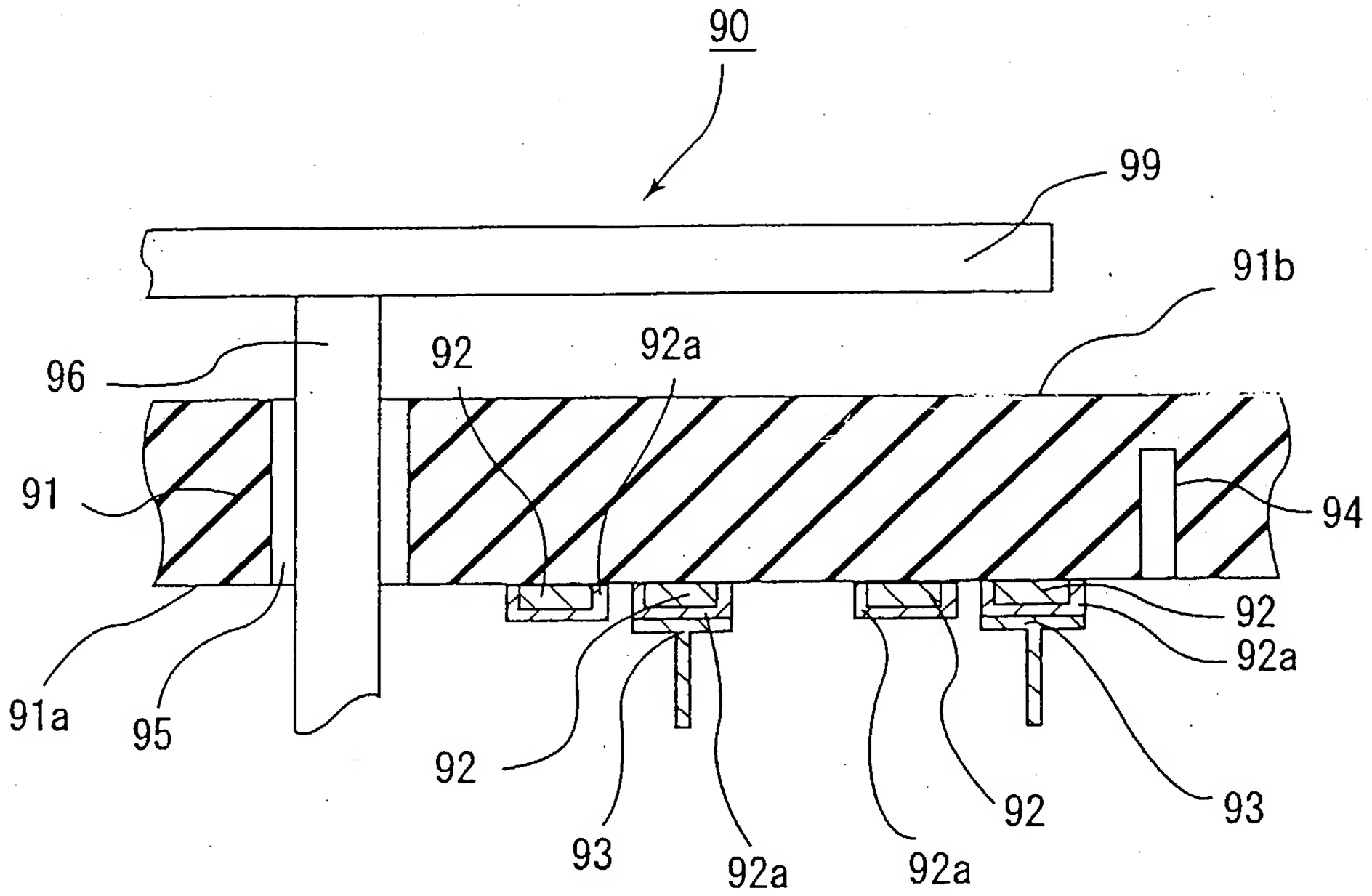


Fig. 1

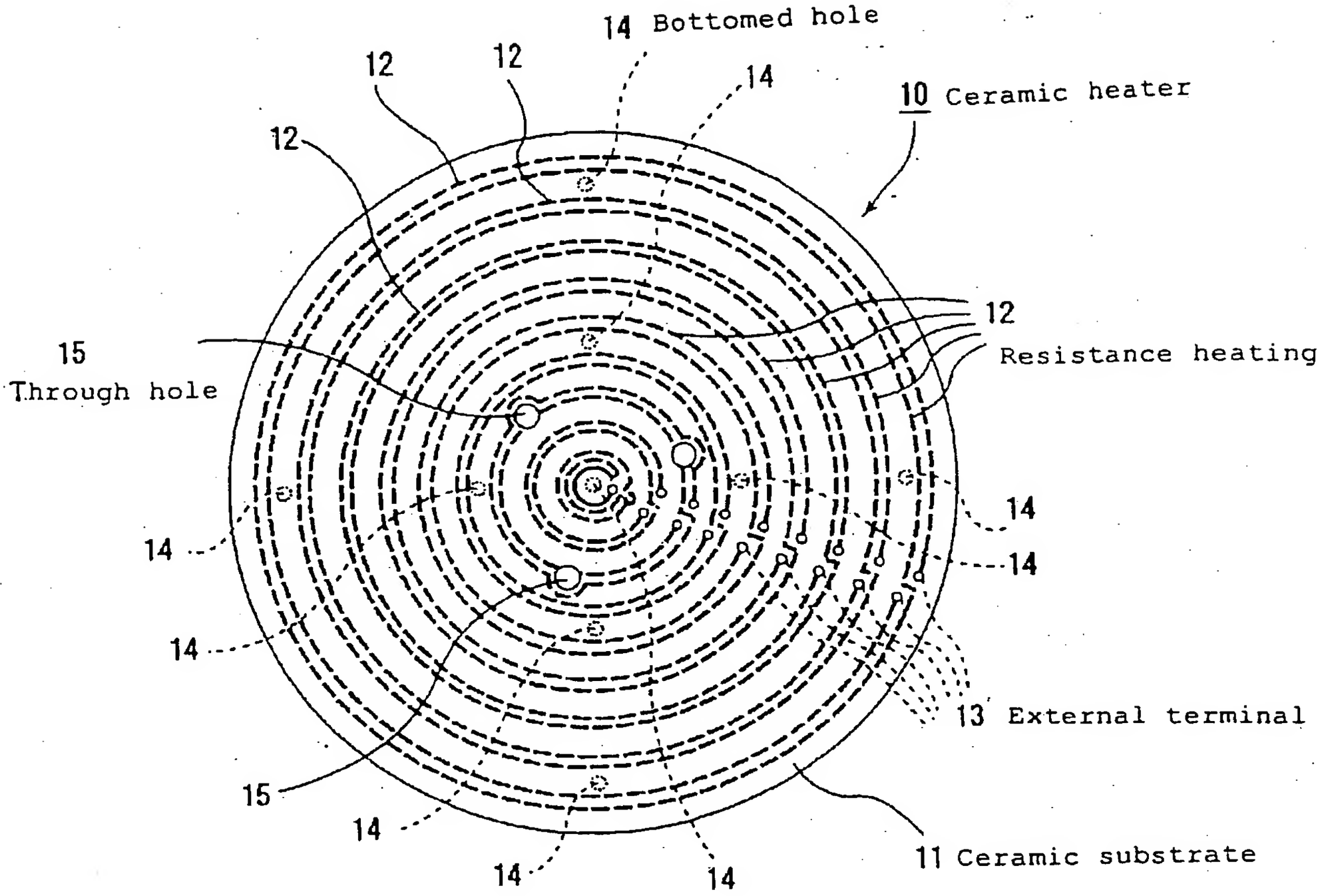

14 Bottomed hole
12
12
14
10 Ceramic heater
12
12
15
Through hole
14
14
14
14
14
14
15
14
14
Resistance heating element
13 External terminal
11 Ceramic substrate

Fig. 2

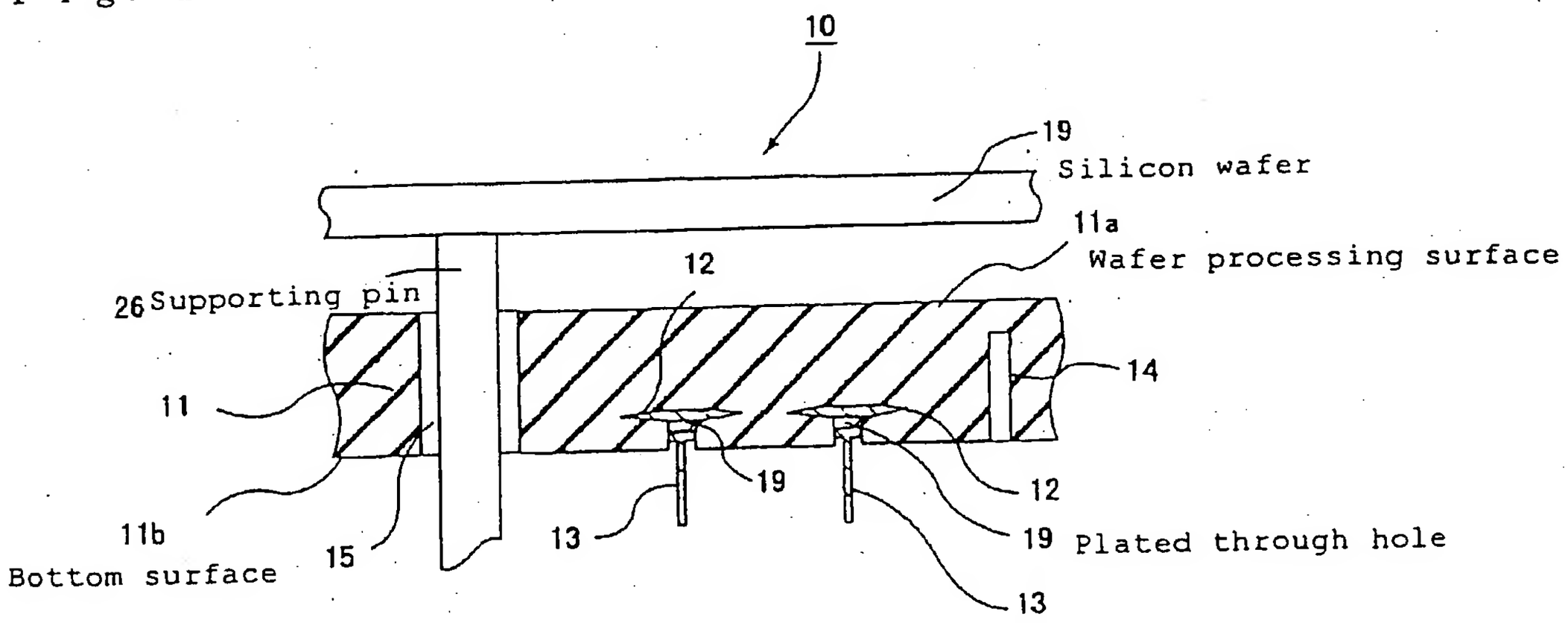

10
19
Silicon wafer
11a
Wafer processing surface
12
26 Supporting pin
14
11
19
12
11b
Bottom surface
15
13
19 Plated through hole
13

Fig. 3

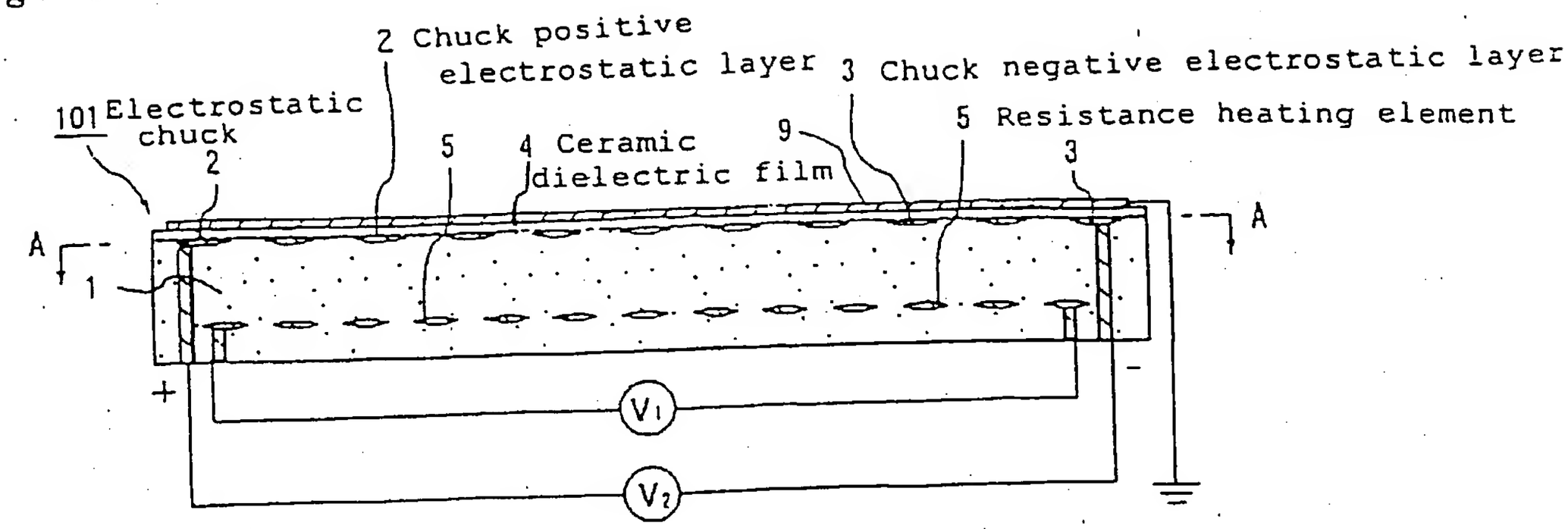

101 Electrostatic chuck
2
2 Chuck positive electrostatic layer
3 Chuck negative electrostatic layer
5
4 Ceramic dielectric film
9
5 Resistance heating element
3
A
A
1
+
-
V1
V2

Fig. 4

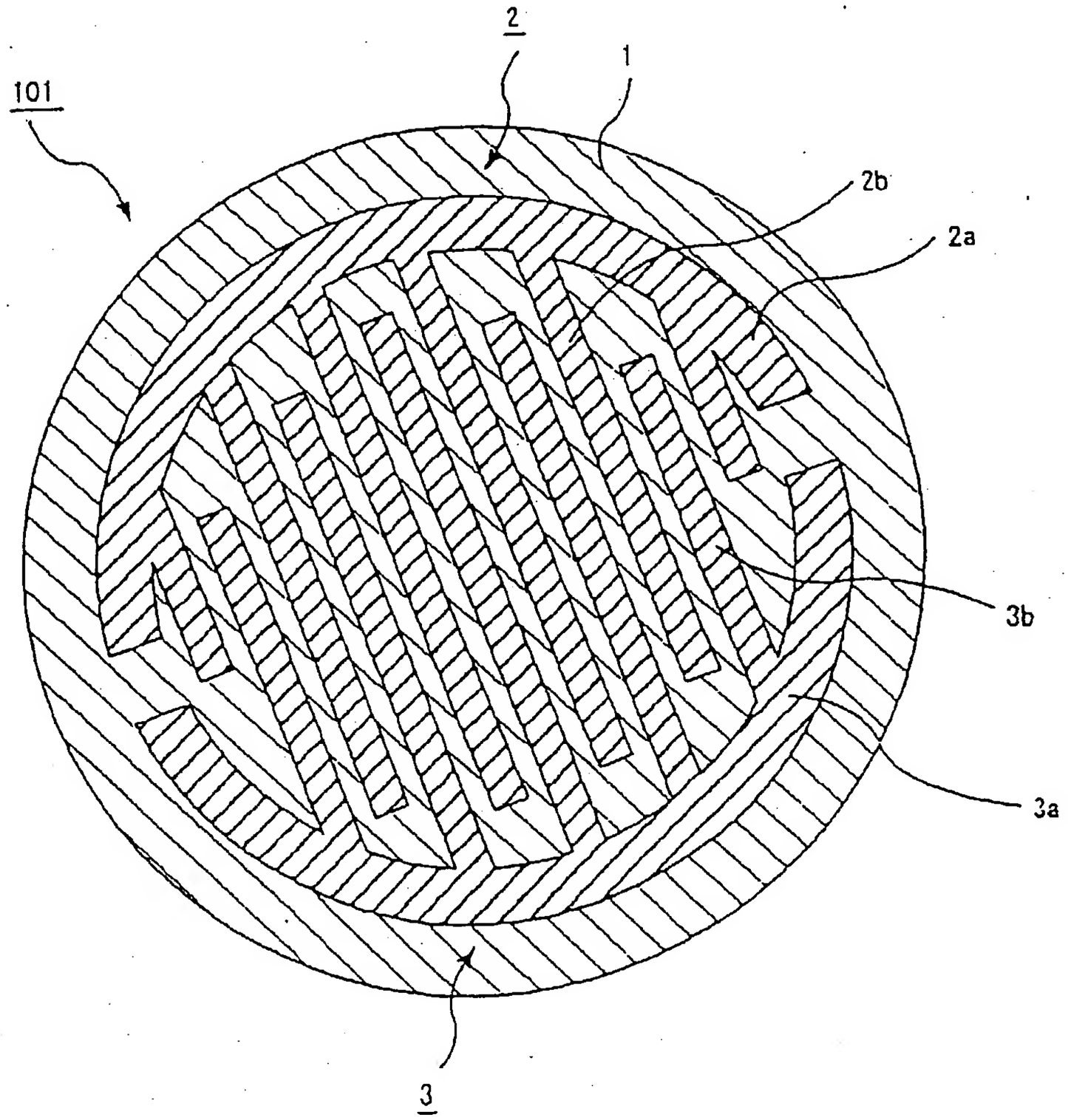

2
1
101
2b
2a
3b
3a
3

Fig. 5

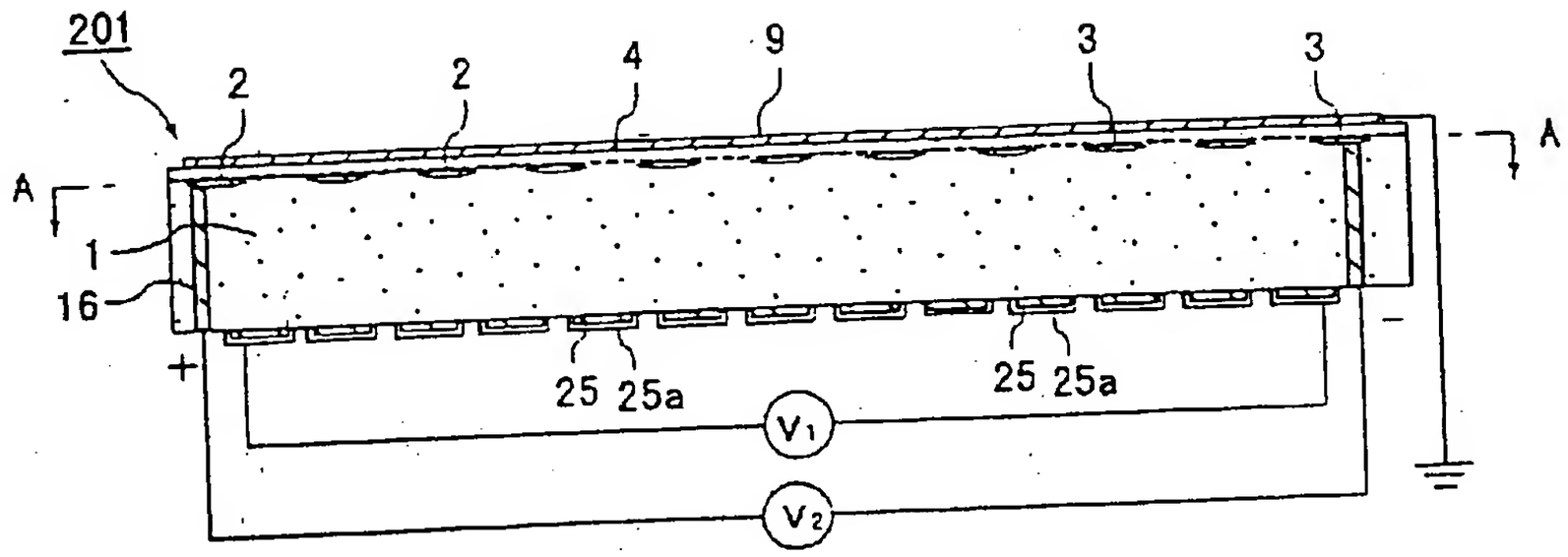



Fig. 6

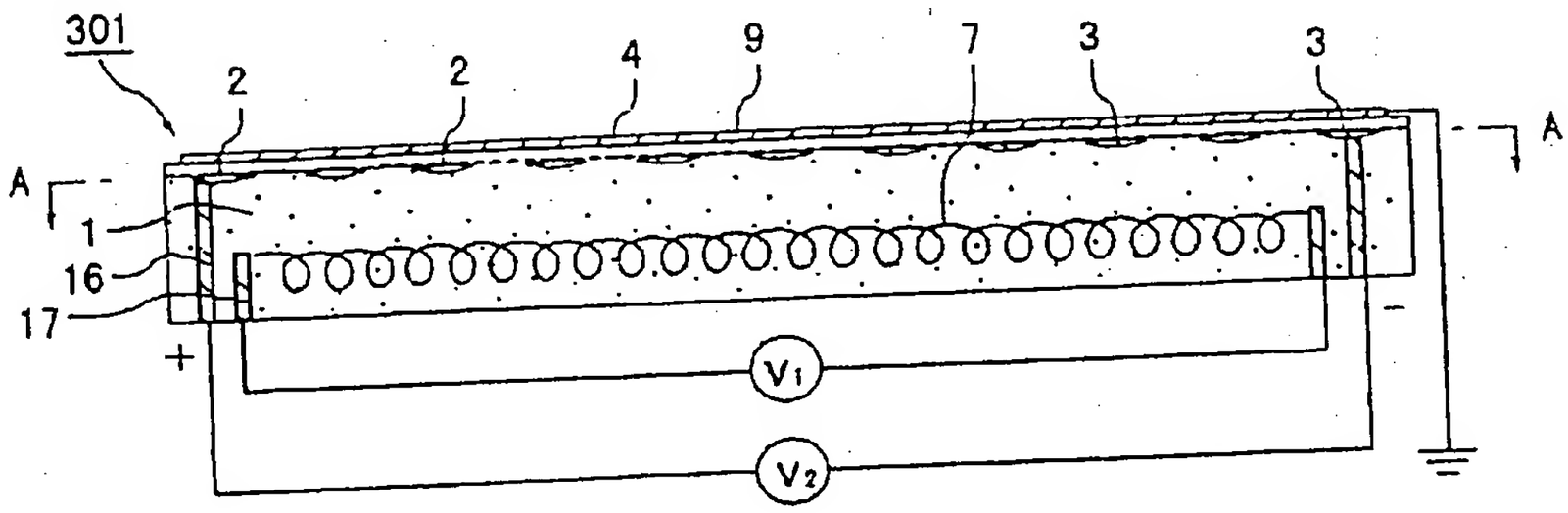



Fig. 7

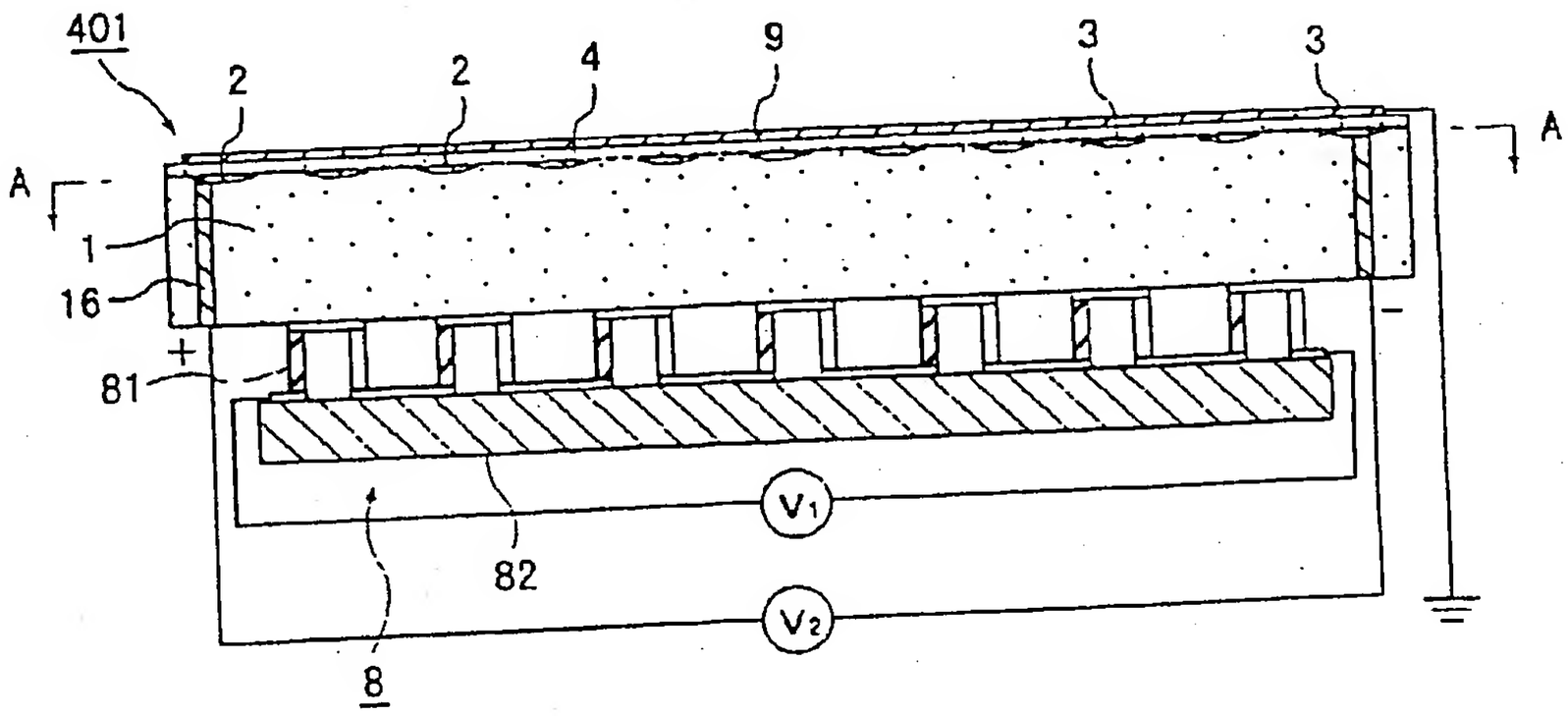
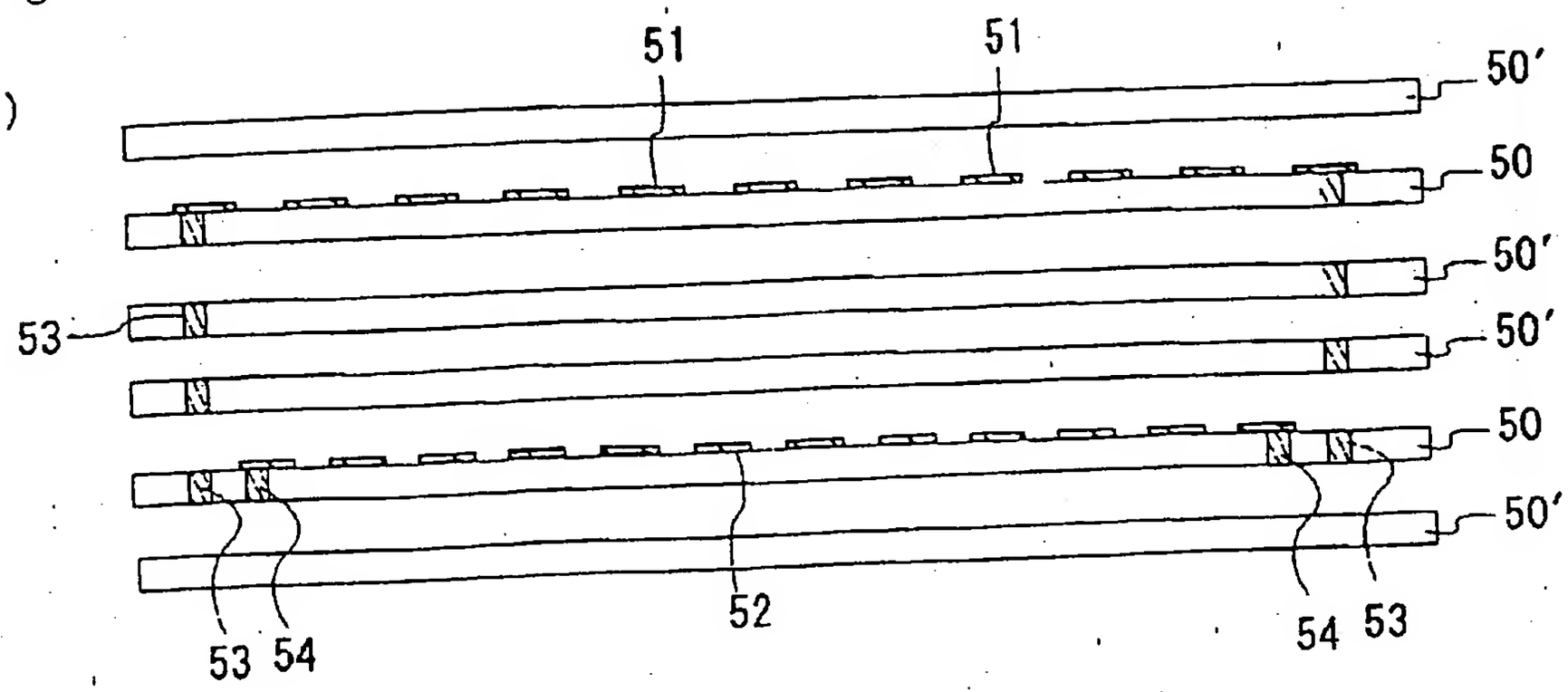
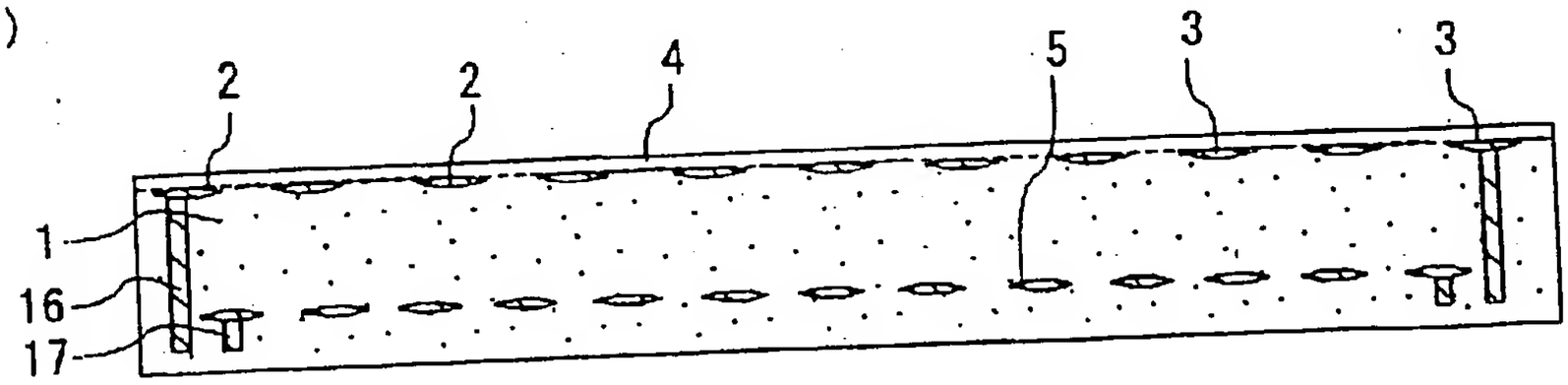


Fig. 8

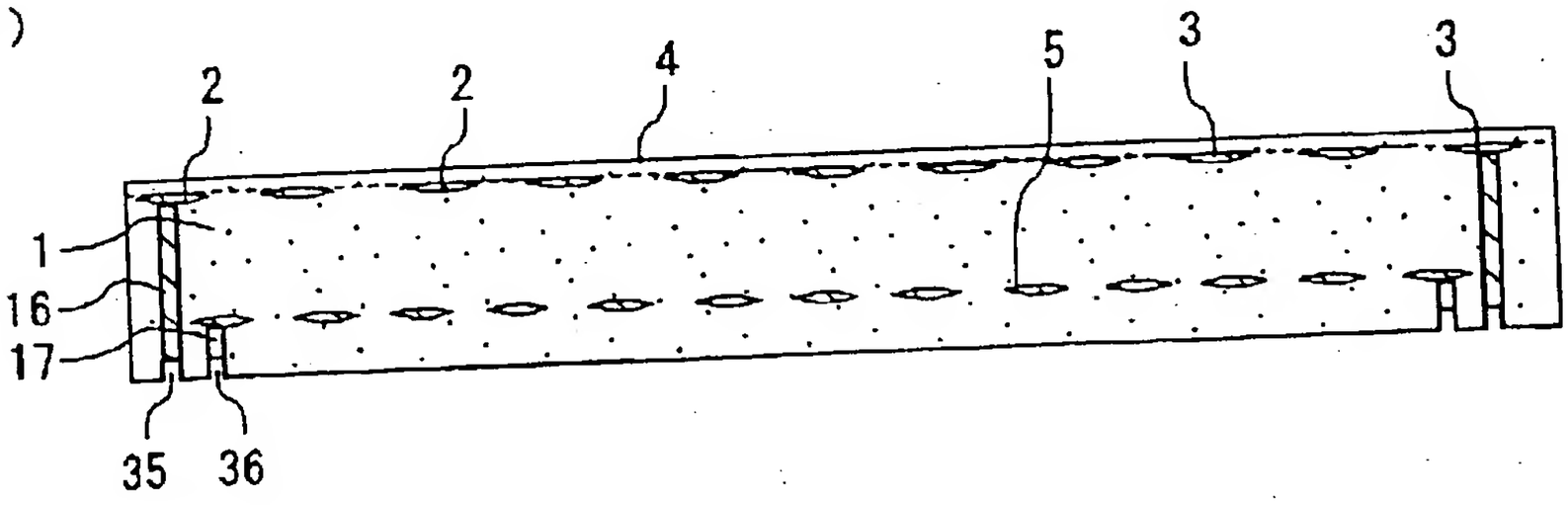
(a)


51
51
50'
50
50'
53
50'
50'
50
50'
52
53 54
54 53

(b)


2
2
4
5
3
3
1
16
17

(c)


2
2
4
5
3
3
1
16
17
35
36

(d)

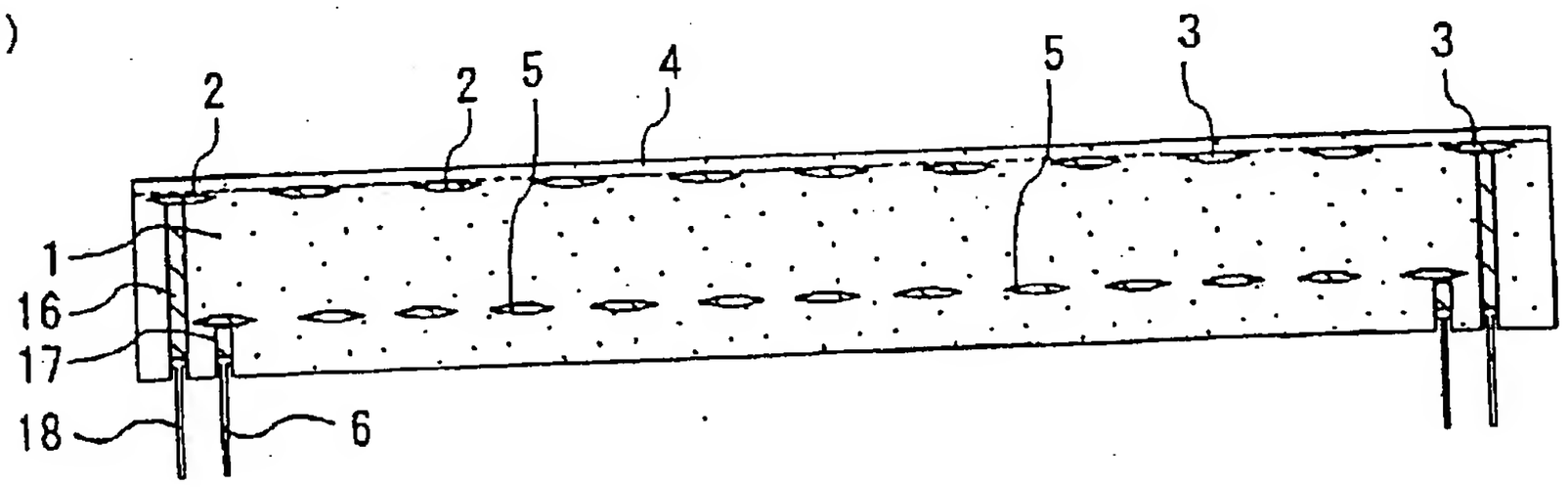

2
2
5
4
5
3
3
1
16
17
18
6

Fig. 9

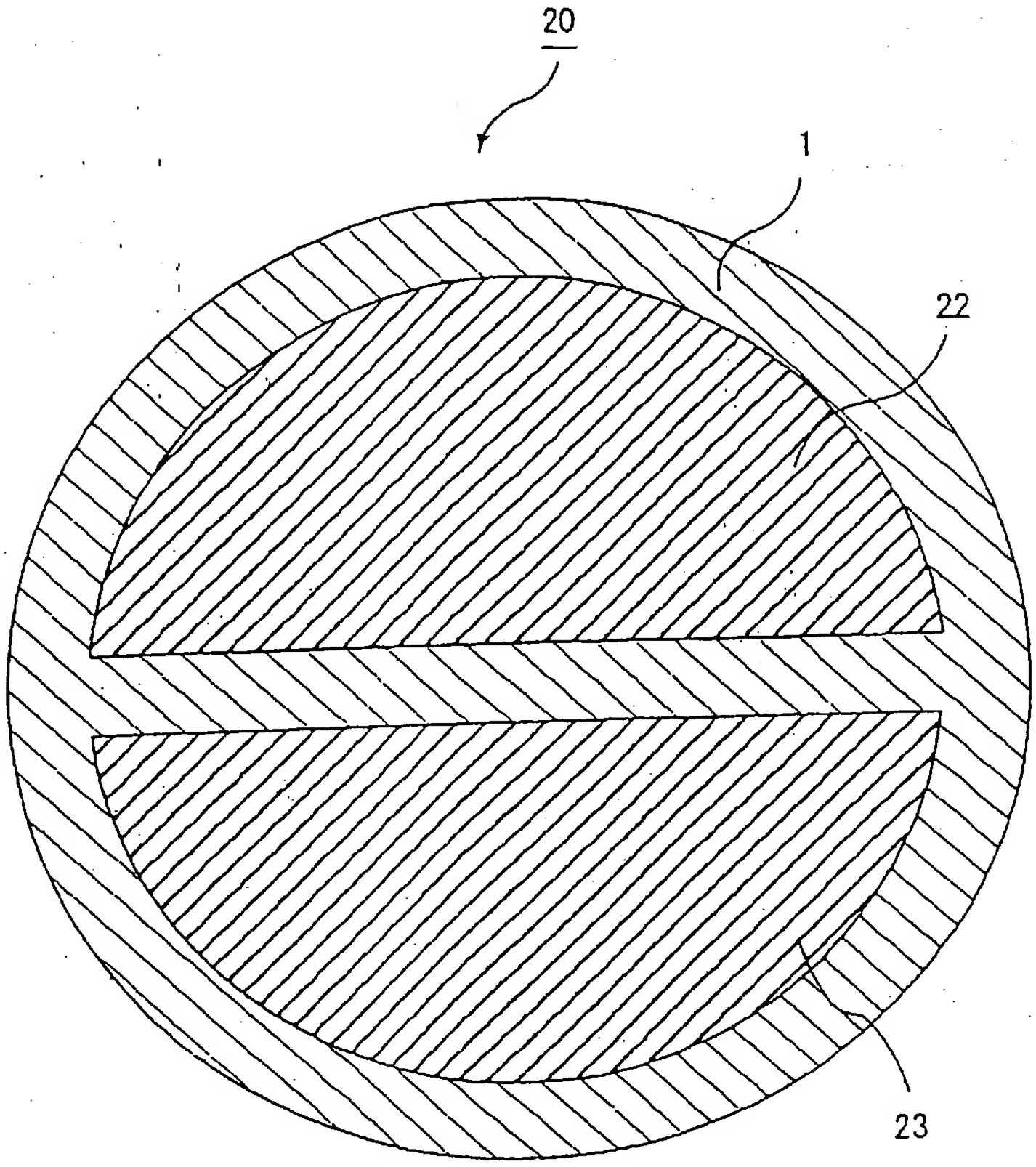


Fig. 10

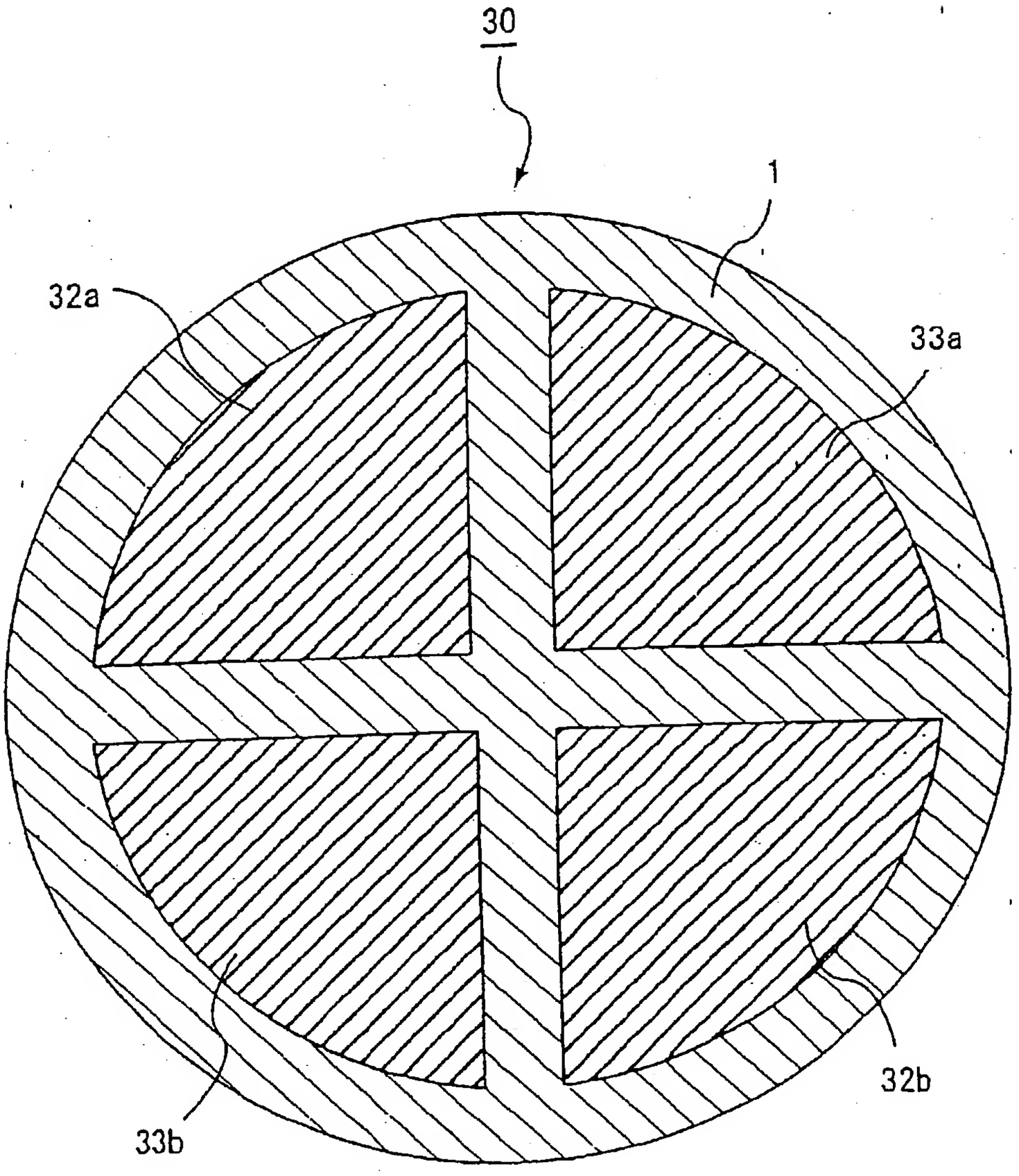



Fig. 11

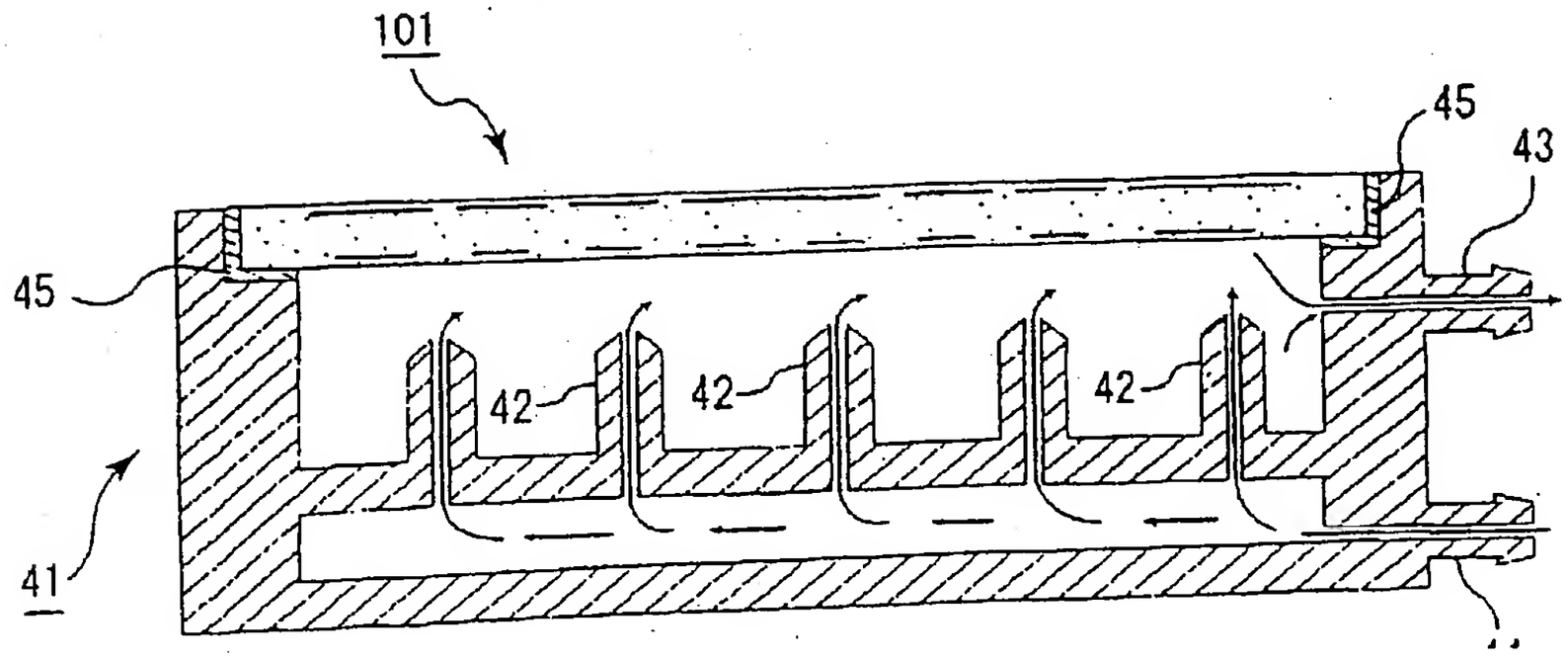


Fig. 12

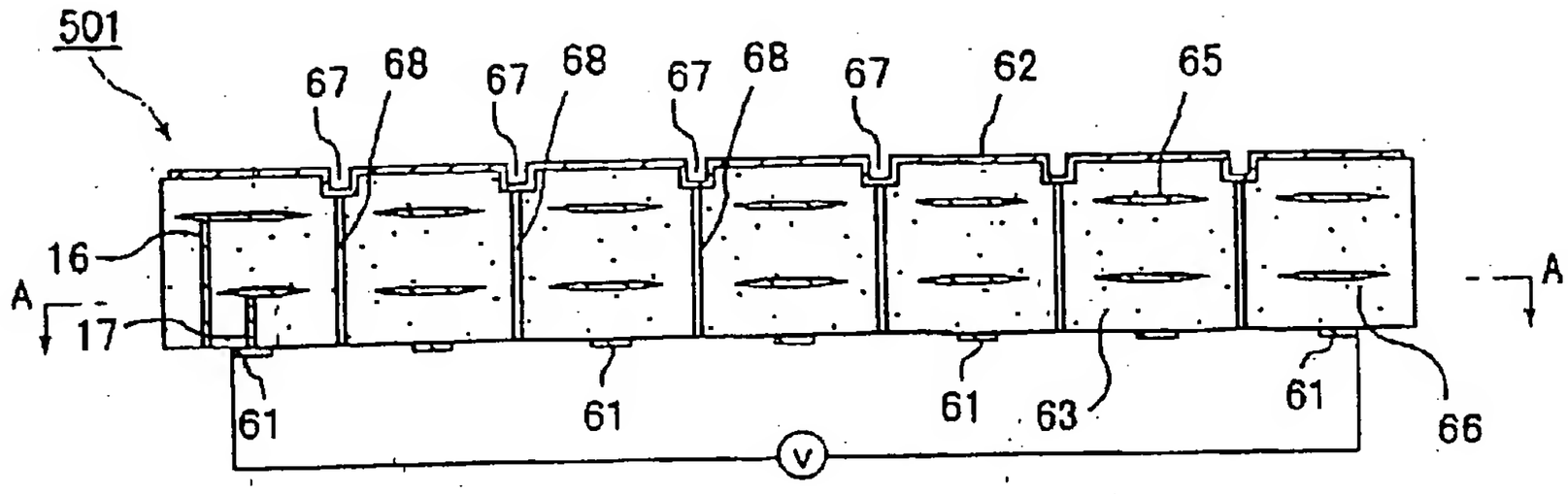

501
67
68
67
68
67
68
67
62
65
16
A
17
A
61
61
61
63
61
66
V

Fig. 13

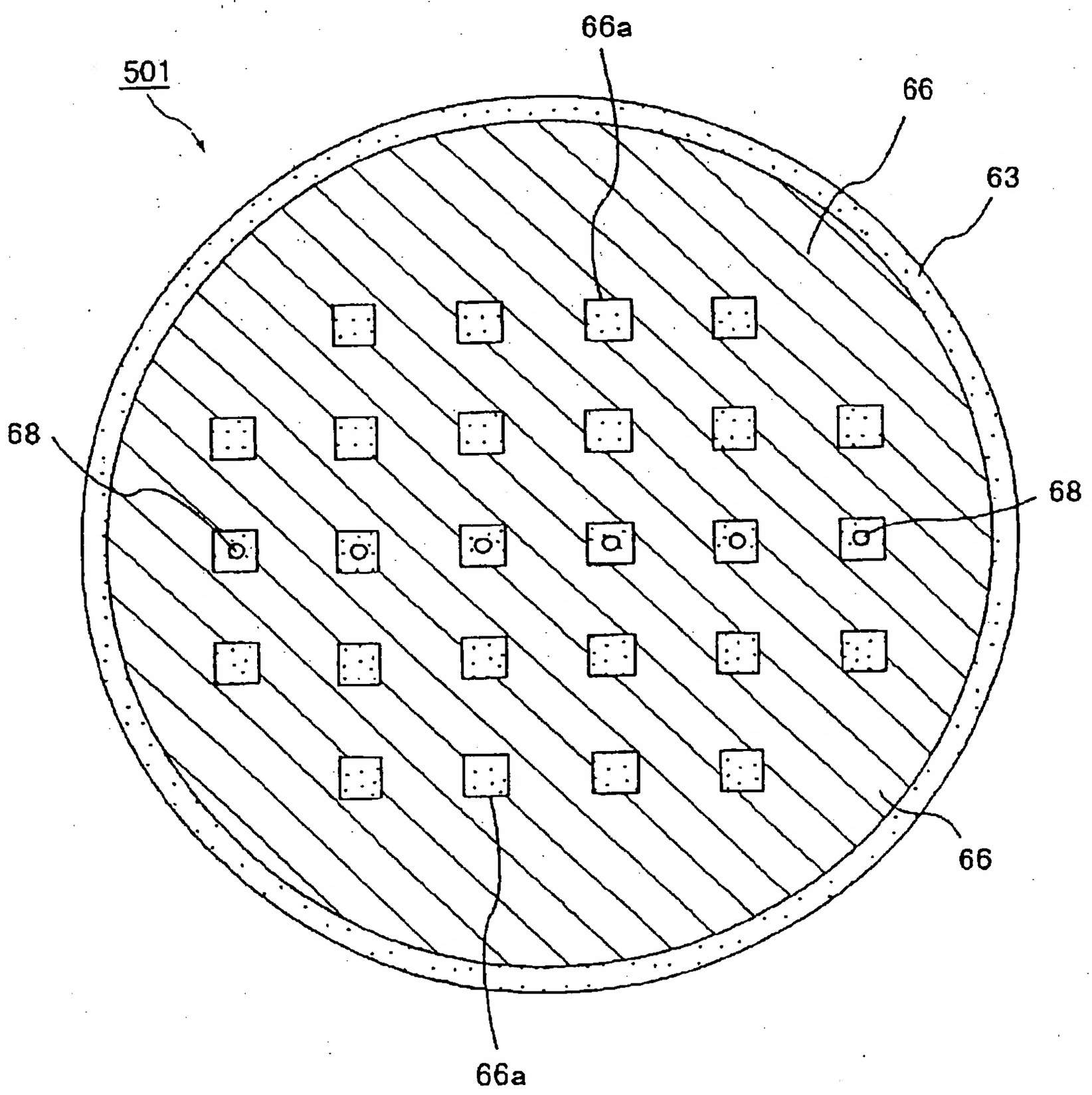

66a
501
66
63
68
68
66
66a

Fig. 14

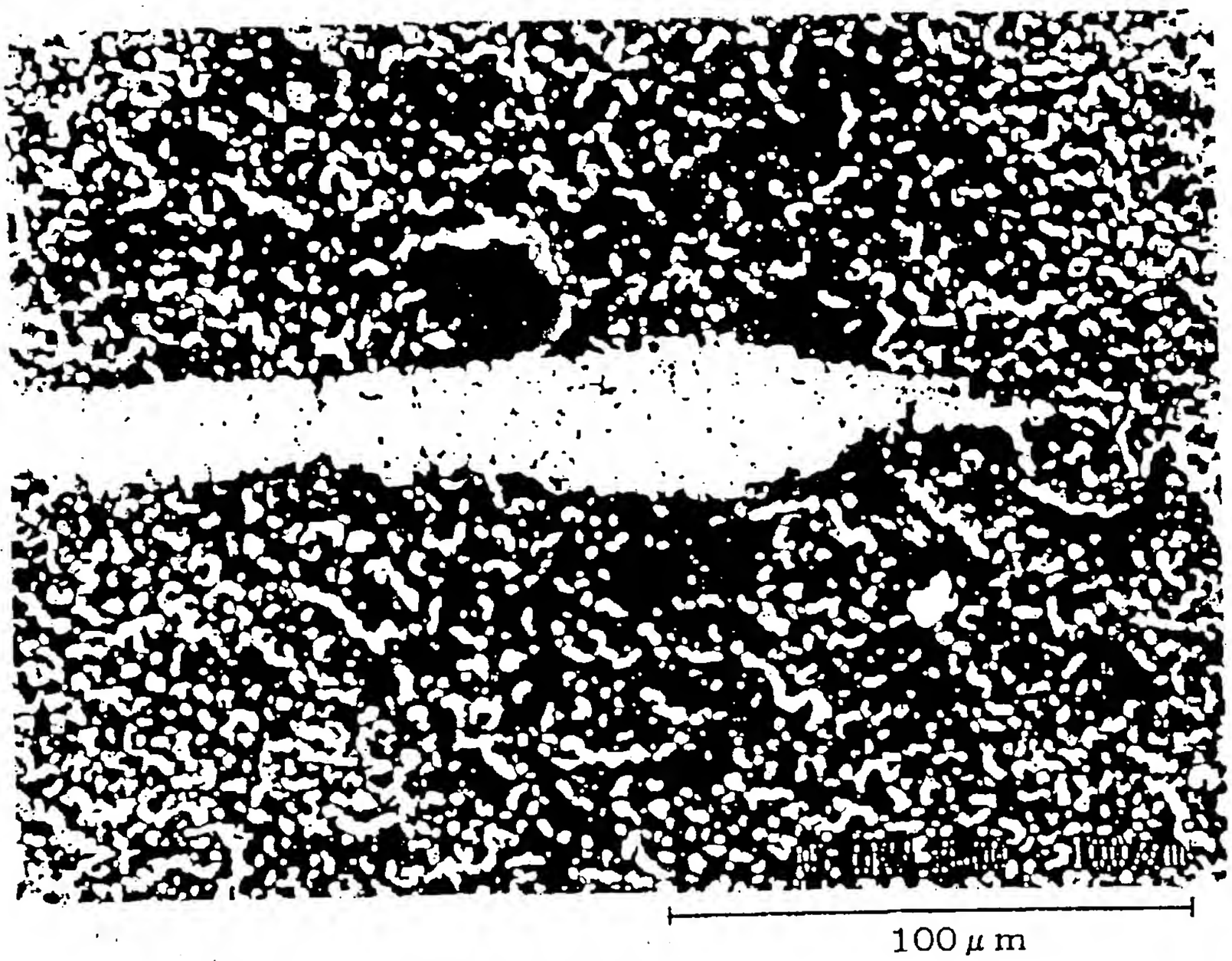


FIG. 1

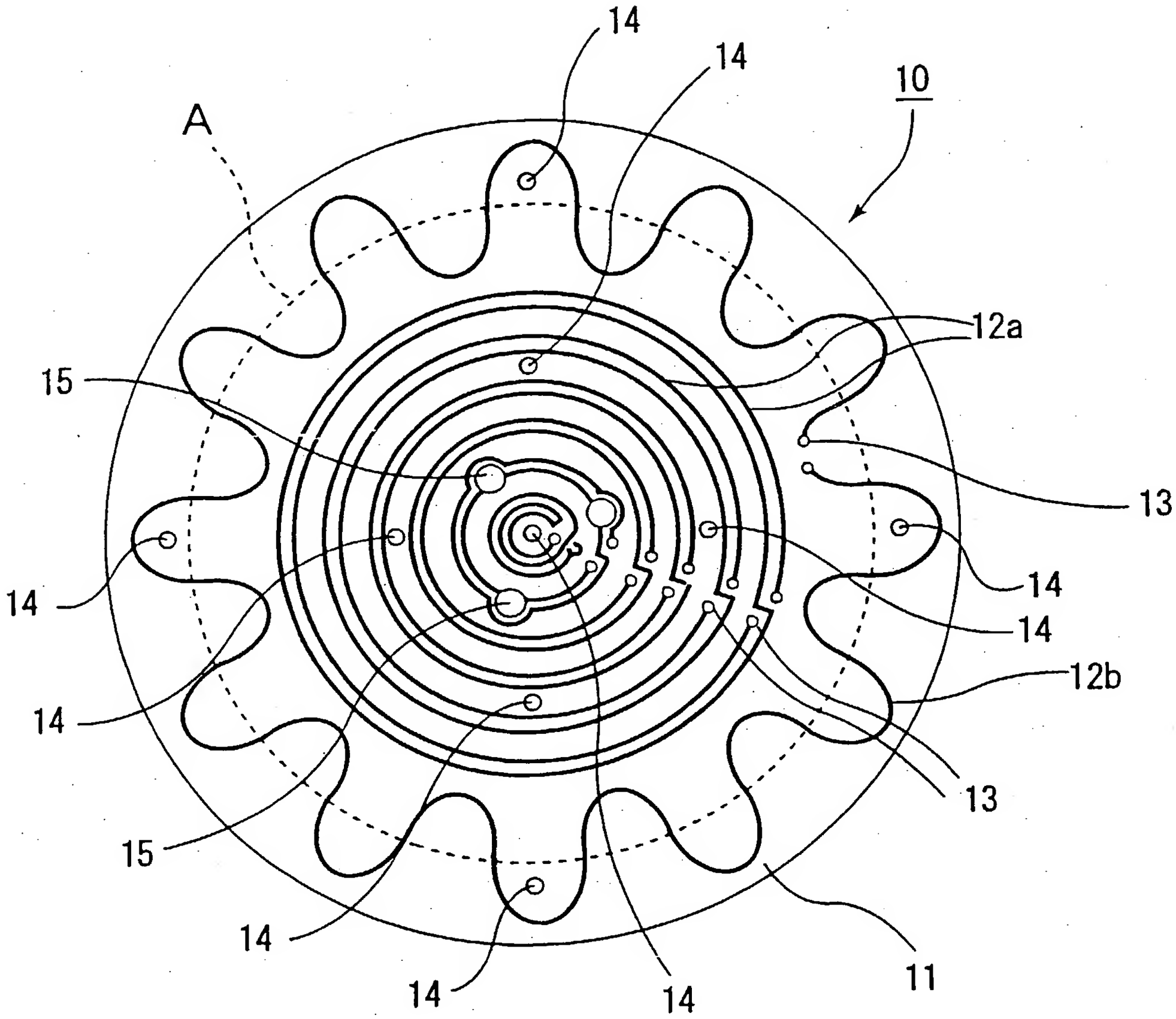


FIG. 2

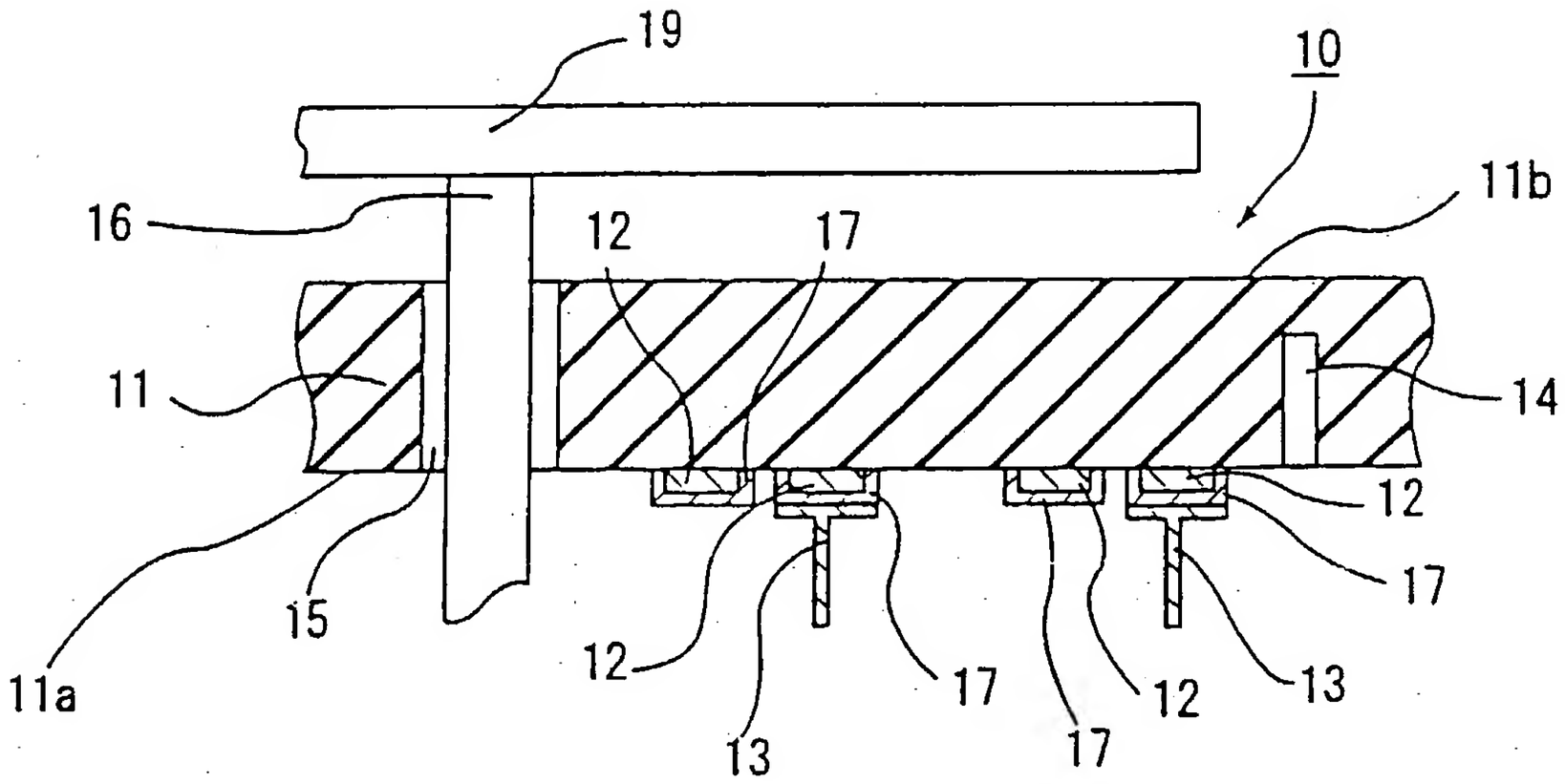

19
10
16
12
17
11b
11
14
12
15
17
12
13
11a
17
12
13
17

FIG. 3

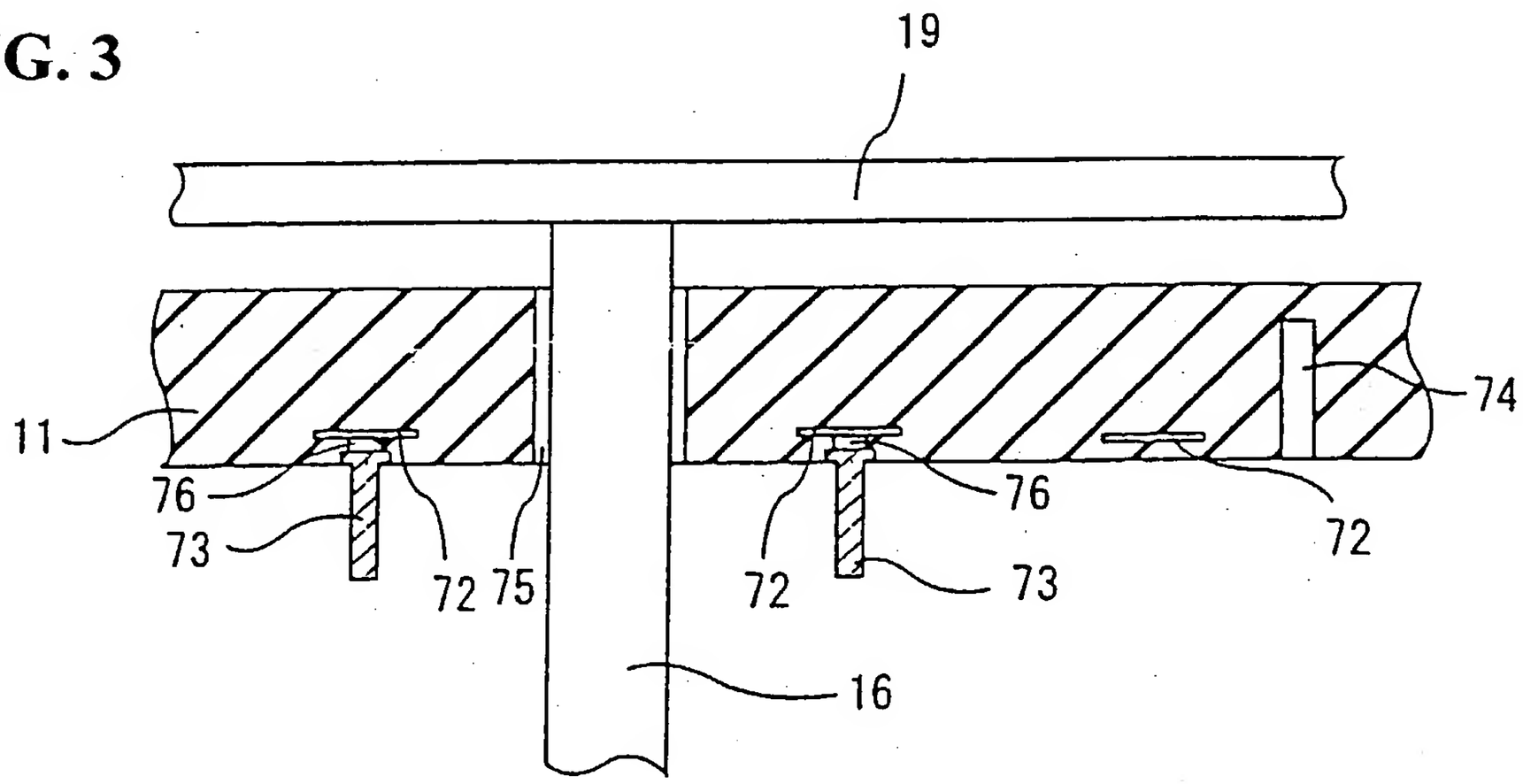

19
11
74
76
76
73
72
72
75
72
73
16

FIG. 4

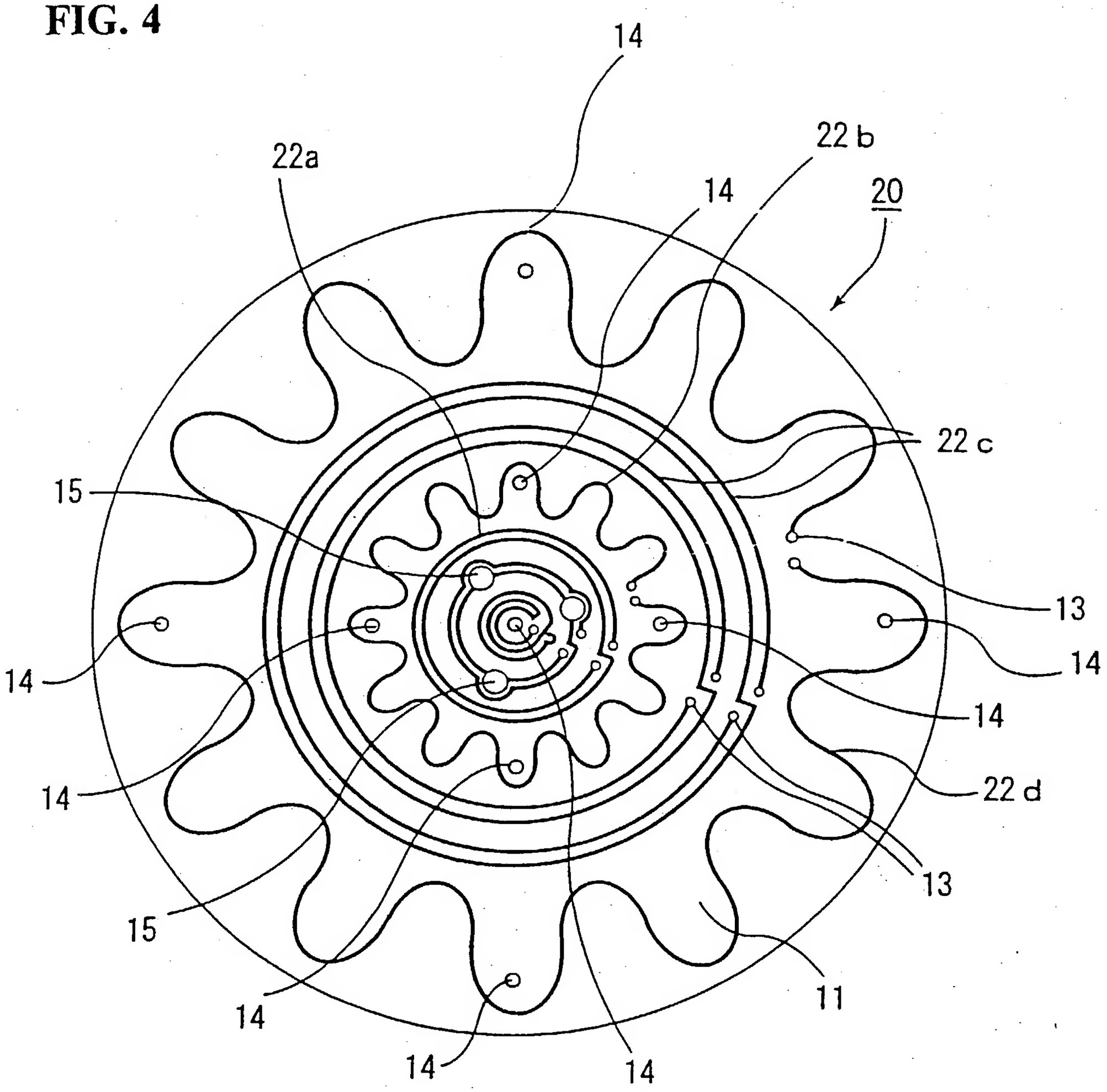
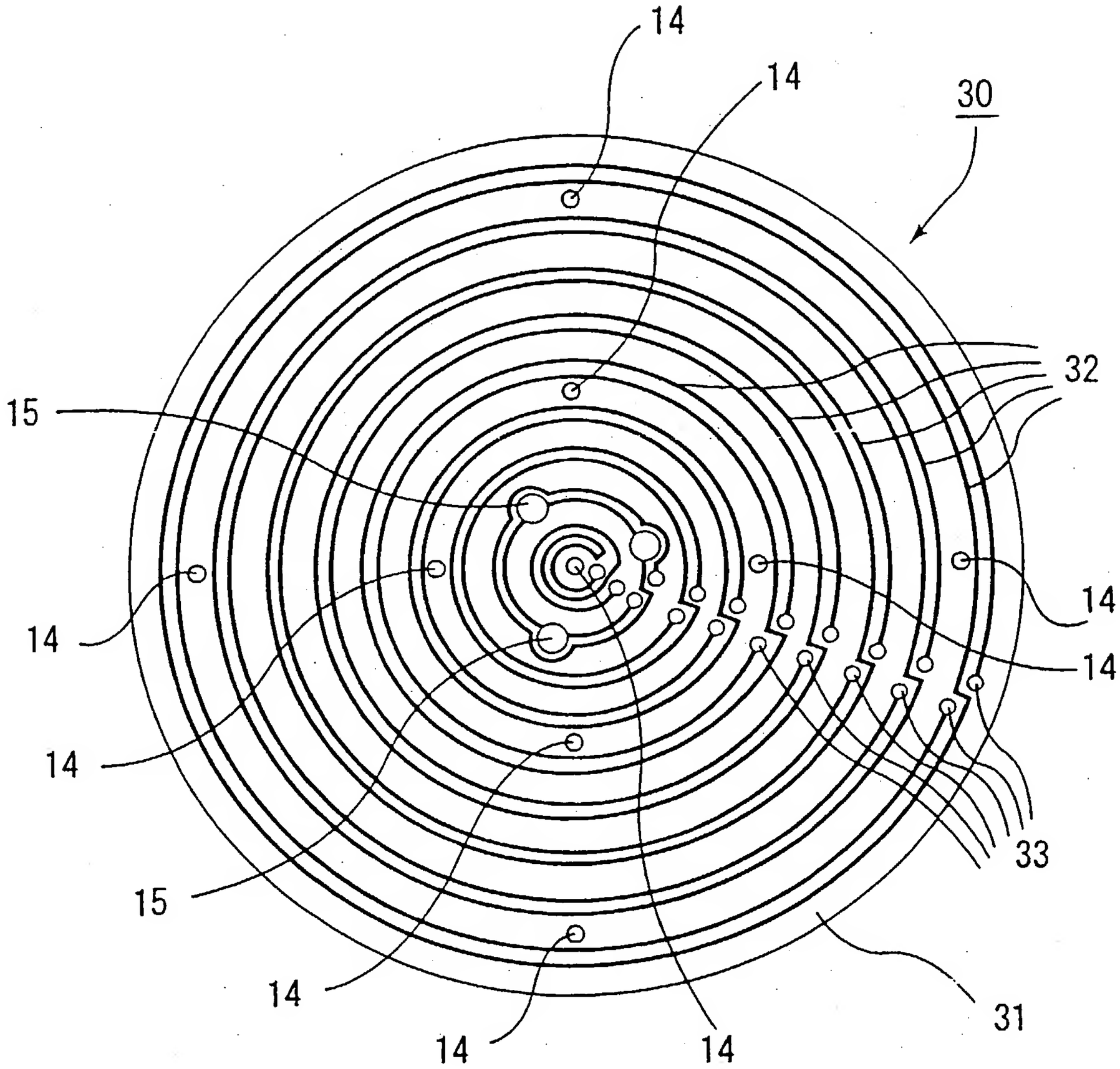


FIG. 5




PRIOR ART

FIG. 6

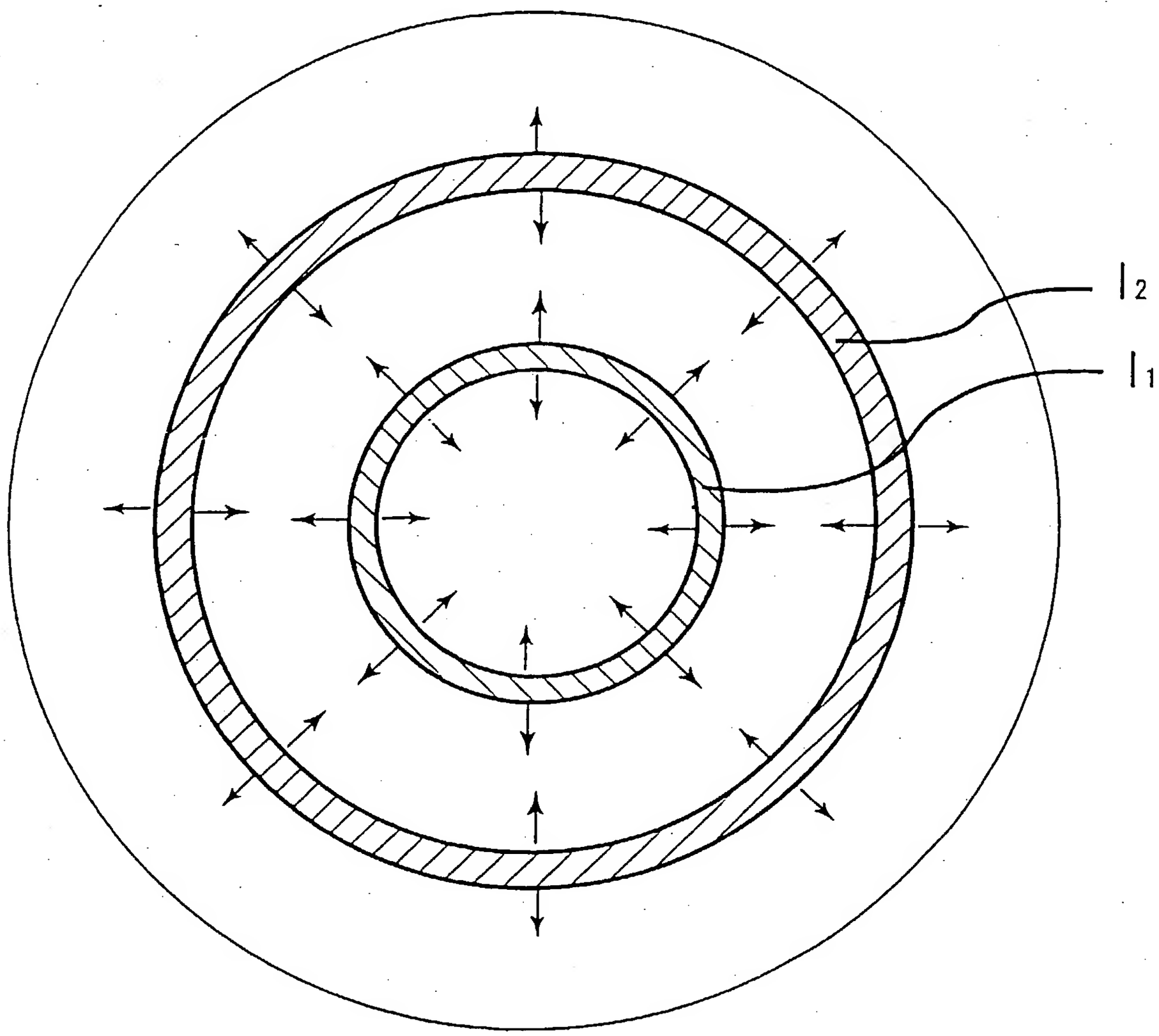


FIG. 7

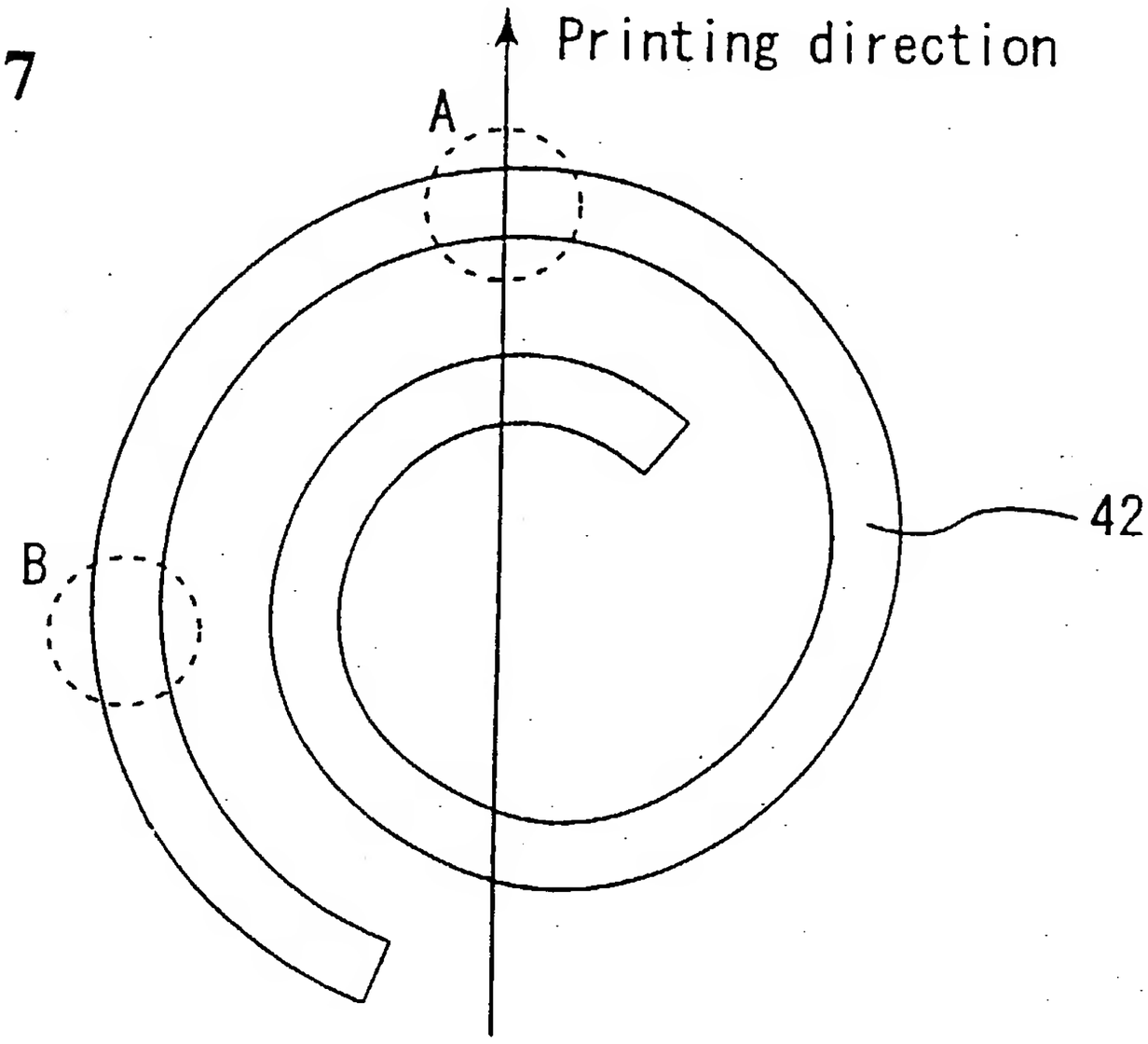



FIG. 8

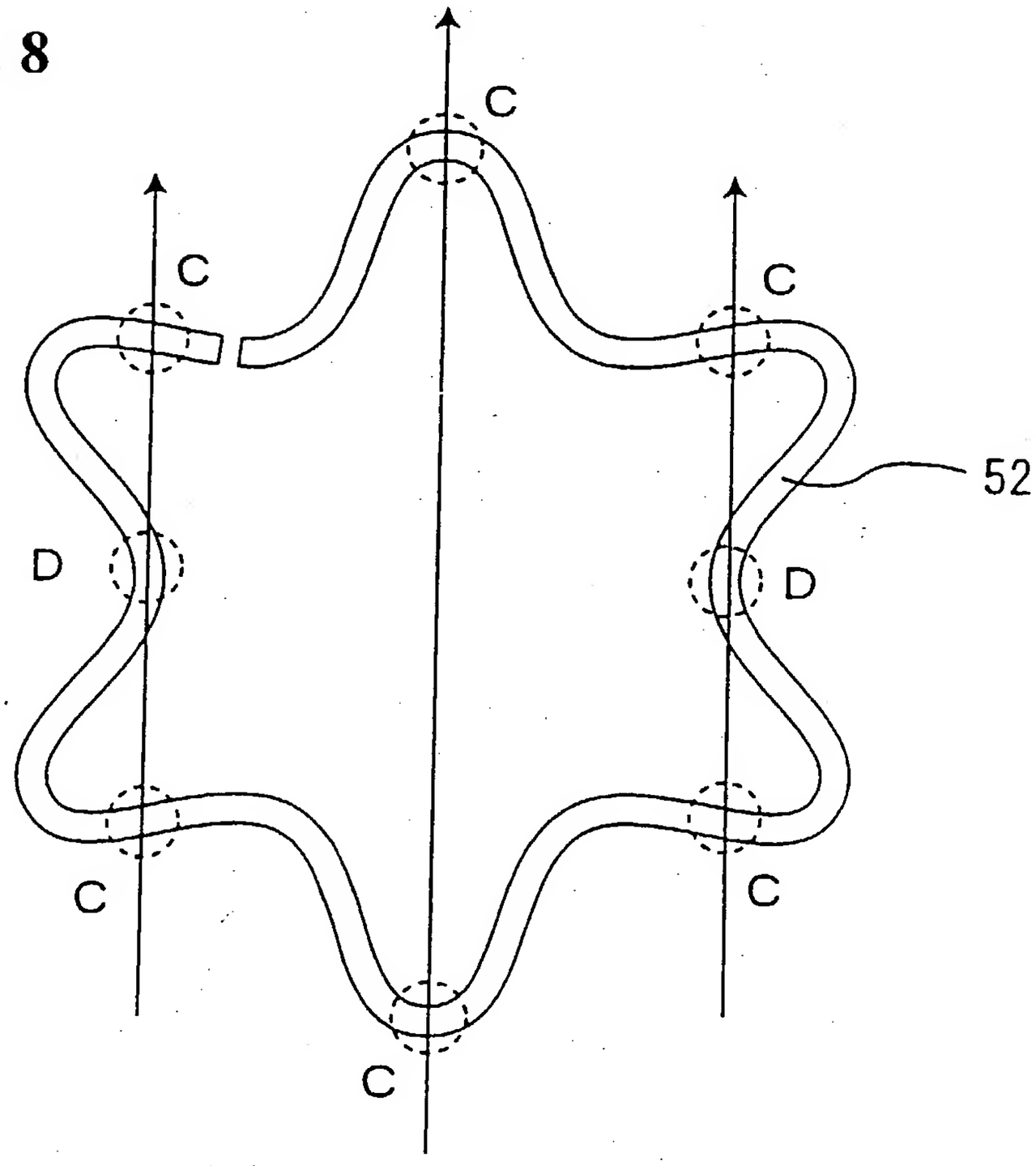


FIG. 9